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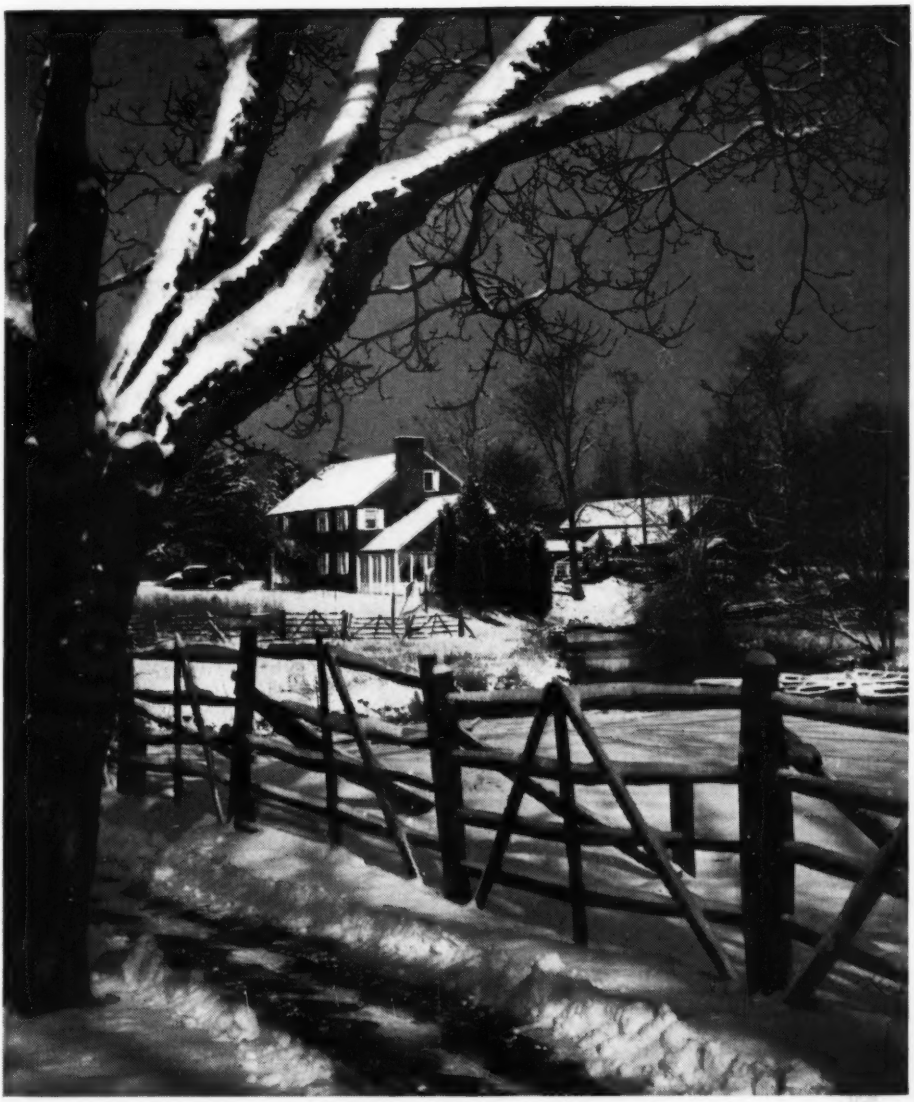

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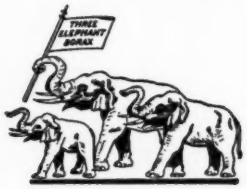

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Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXI NO. 1

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TELL-TALE TRAILS

Better Crops with PLANT FOOD

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VOL. XXXI WASHINGTON, D. C., JANUARY 1947 No. 1

Anticipating . . . . .

More Food, Fewer Farmers

Jeff McDermid

IMMIGRANT white men during the past two centuries moved the pastoral aborigines away to make room for the plow and the farm. Now these white races have become so successful in their mechanical perfection of production that they also are slowly moving off the land themselves, to huddle in congested cities.

To be sure, no Indians in so short a time in their accustomed ways could have transformed the wilderness and the plains into such a reservoir of food with which to safeguard the lives and the fortunes of so vast a host of people. Likewise, no Indian would have done some of the reckless, wasteful, and destructive things which we are belatedly trying to correct.

Our first settlers wanted room and freedom, dimly seeing a chance to build up a new vision of equality and opportunity. That they swiped huge areas of valuable land and natural conservation treasures while seeking to model a liberty-loving nation is probably a bit late to discuss. I presume our immediate task is to see that we preserve what we seized and dedicate it to the future in a way to offset some of the reproach in the original grab. Some developments lately rather discourage any optimism in that regard, but most of them lie in other realms than agriculture, the saints be praised!

Back in the first Yankee settlements of the Northeast, and to some extent along the Tidewater southward, farm families who replaced the poor redskins had little idea of acquiring cash wealth which they could spend in buying

gadgets or taking tours with gaudy vestments and generous tips. We are all familiar with the self-sufficing nature of that colonial scene, where each farm was an end unto itself for the most part. Just a few necessities like iron, salt and some crude tools and equipages were bought in the small hamlets near their plantations.

LIFE was not easy physically, but the land supported a healthy, independent people who had courage and ability and called not upon the government or their provincial assemblies for much except reasonable measures for defense and common welfare. No far-flung commercial network relied upon them in the mass for trade and employment. Of course, the seeds of the great industrial system were germinating, but back in 1800 fully eighty per cent of the American population called the farm its home.

Before 1830, however, many farms began to show fainting spells and especially in New England were conditions such that boys soon found it wiser to inquire into opportunities lying in adjacent towns to enter mercantile, industrial, or railway careers. Lack of decent regard for the soil itself caused this in no small degree; although to be sure, the average farm family nurtured under thrifty and healthfully invigorating circumstances was as prolific as rabbits almost. That is, the rich virgin land bred up multitudes of human beings who later on found it more profitable to abandon attempts to coax more life back into the soil and to turn commercial. That's the first evidence we have of how commercial urges have deprived the land of its natural sustaining power, but it's not the last sign of such influence.

So we had captains of industry and merchant princes and even big showmen like Barnum leaving the cramped and meager topsoils of a decaying agriculture to push their fortunes in more favored places. When they began to do that the rest of the folks on the hill-holdings either hiked westward in droves or surrendered to a movement that smashed old craftsmanship locally and ushered in a growing non-farm economy.

I suppose we can pause here to remark that your dumb Indian would not have been smart enough to quit farming and go elsewhere when the land got lean. You can probably point to hundreds of redskin camps that froze out and left nothing but white bones behind. They were not engineers or architects or promoters. I don't expect they ever would have invented atomic bombs either—and by no stretch of imagination could you think of Hiawatha working as a tenant farmer. There's plenty they didn't think of, and a whole lot more it's too bad we ever did ourselves.

The white race, however, has used the farm as a source of food and raiment, as a refuge from spells of adversity when the big commercial machine broke down, and always as a place from whence must come the strength and the new blood to build up the rest of the whole American economy. I will not add that it has been a source of some votes and headaches, because this is, has been, and will continue to be painfully obvious.

BY this time the biggest part of the adventure seems to be over, or that is what so many aver. The wild country is gone—some of it into better conditions and a lot of it into worse. Since the rise of skillful experiment stations, we shrug our shoulders at further land seeking, because virtually all the land worth while under a profit system is already yielding up many times what we imagined it could. But unless we take heed and organize to conserve it, it may not be too long before we begin homesteading again on acres hitherto devoted to mountain goats and lizards. We'll have to admit before we get too boastful that the aborigine himself actually had much more good farming opportunities than

we have. A good share of that opportunity lies in the oceans to which certain swift streams bore our soil.

I suppose everybody notices certain trends which are like Mark Twain's weather. You know they occur and that they often have vast significance for everyone, yet nobody can do very much about them. You can't go out in the road and stop trends or holler

out loud on the radio and shift their course.

Anyway, there are said to be at least four major trends going on in our midst affecting farms and farm folks. First of all, with the coming of the machine age in agriculture we find fewer people on farms. The same thing occurred in the many advances made in industry. Some lost their places. In industry, however, there was usually some new invention or some new mode of life brought about by the machinery that opened new jobs.

It doesn't look right now as though agriculture could fix up more jobs to keep step with those which are lost because of the greater amount of work which one man can do in a season, mostly sitting on the seat of his pants. Some wiseacres insist that chemical marvels and new processes for the food and fibres raised on farms will provide just that extra employment we are looking for so hard.

Take tractors. I can recall those first demonstrations on farms by rival implement manufacturers and dealers. Observers thought it just about as likely that ordinary farmers would ever drive one of those snorters afield as that the small boys attending the circus would ever be ringmasters.

The census columns tell us that in 1910 not one farm in 1,000 had a tractor. In 1920 they were used on one farm in 28. In 1930 every seventh farm had one. The latest count taken in 1945 indicated that a tractor was furnishing field and belt power on one farm out of every three.

Our wheat harvest is all made by machinery. Corn is on the way and almost there. Cotton is next, and that really means something when it comes to displacing folks.

The coming of the completely mechanized cotton job will affect the lives and fortunes of over a million of the rugged basic stock of rural people in Dixie; and when it arrives by degrees, there is going to be need for adjustments that will make the corn and hog and little pig fracas of 1933 seem small as a midge.

Then you will also see a new design of tractor that will have equal speeds in both directions, and moreover there will be tractors so cheap and hookable to any kind of implement at any job that even the small places can hardly afford to navigate in the sea of changing agriculture without one.

SUCH trends toward doing the food-raising job quicker and easier are bound to kick up some dubious conjectures anon, and set the planners busy overtime. Maybe the government won't be able to stay out of the picture either. Trends like that take the average fellow unawares and upset his apple cart. I hope the human stomachs can expand enough to justify all this speed-up and efficiency.

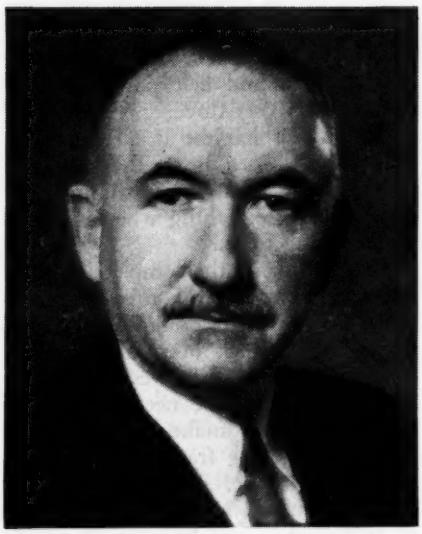
Right along with mechanization there is the improvement in hybrid corn and

(*Turn to page* 51)

Thirty Years of Building-up The Soils in Wisconsin

By L. G. Monthey

Madison, Wisconsin



Clint J. Chapman, extension specialist in soil fertility.

FARMERS in Wisconsin are making real progress in building up their worn-out soils. In the past ten years they have applied more than 10 million tons of lime to the acid soils, so common throughout the State. During the same period they have increased their usage of commercial fertilizers by more than seven times, a record that few states, indeed, can even approach. In the year 1935 they used slightly over 28,000 tons; by 1944 they were using over 230,000 tons annually—a tremendous increase in the use of soil-building plant food that makes for better crops and more farm income.

Many people would attribute this amazing increase to the AAA and its program of benefit payments, for it has been a powerful factor in soil-improvement work all over the North Central Region. In 1943 alone, nearly 100,000 tons of fertilizer were distributed by this agency in Wisconsin.

However, close observers of this Wisconsin "miracle" are inclined to give more than just a little of the credit to an energetic, gray-haired man who has "stumped" the State for 30 years, awakening farmers to the need for soil improvement.

Professor Clint J. Chapman, known to thousands of Wisconsin farmers as "Chappie," ranks among the top soils extension men of the country. His enthusiastic, convincing talks at farm meetings are as "catching" as the measles; his thousands of feet of colored motion pictures keep farmers on the edge of their seats, when even an exciting Mickey Mouse film would fail to keep tired, out-of-doors people awake. His advice is eagerly sought not only by farmers, but also by fertilizer men, government officials, agricultural agents, and classroom instructors at the State College of Agriculture.

In 1916, when Chapman began his educational program of fertilizer experiments and demonstrations, less than two per cent of Wisconsin farmers were using commercial fertilizer, and the total annual consumption was less than 3,000 tons. By 1939, one farmer in five was applying plant food to his soils, and he was using an average of 1½ tons per year on his farm. Since then the increase in fertilizer usage has been phenomenal, and only the shortage

of fertilizer materials has kept the tonnage at the 250,000 mark. Chapman's years of back-breaking toil were at last bearing fruit!

"I am glad," says Chapman, "to have had a part in this great program. It has been a battle against the forces of indifference and even downright opposition. In the early days even many of the county agents and other extension leaders had to be sold on this soil fertility idea.

"Our first soil fertility work in this State was primarily with potatoes and tobacco, both heavy feeders on plant food. Very little work was being done with small grains 30 years ago, and the hill application of fertilizer for corn was just getting underway. Our fertilizer mixtures were of very low grade compared with those in use at the present time."

The high-grade fertilizers of today, such as 0-20-20, 3-18-9, and 3-12-12, were relatively unknown in the early years of Chapman's work. Farmers were advised to use three and four hundred pounds of 1-10-1 (1 per cent nitrogen, 10 per cent phosphate, and 1 per cent potash) or 2-8-2 per acre on their potato fields, and these low-grade materials gave big increases in yield. Even applications of low-grade phosphate alone showed up well. It was therefore assumed that phosphorus was the chief limiting element of soil fertility, and the educational program leaned in that direction.

Need for Plant Foods

It wasn't until 1930 that the widespread need for potash was fully realized. The careful, thorough field experiments of Professor A. R. Albert on the sandy soils of the Hancock Experiment Station convinced Chapman that Wisconsin farmers on lighter soils could use potash fertilizers to good advantage. His field demonstrations resulted in amazing crop responses and supported his conviction. Soon it was found that not only sandy soils, but also peats, mucks, and the low "black bottom" soils were almost invariably deficient in this important fertility element.

Chapman immediately began a vigorous potash campaign throughout the State. Even some of the college people were not quite ready for the idea. One man, prominent in Wisconsin agriculture for nearly 30 years, came to Madison to voice his protest. "Chapman is talking potash promiscuously all over the State," said he.

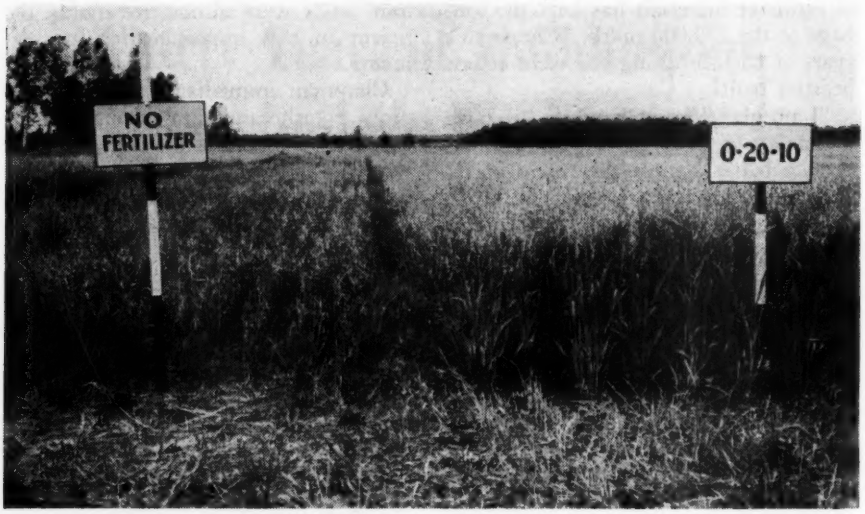
Chapman has never quite been able to live this one down. Even today, years after, his colleagues delight in asking about this episode.

But the campaign continued and Wisconsin farmers became "potash conscious." No longer was phosphorus the chief element in soil fertility. Potash was literally "on the lips" of county agents, agricultural teachers, and farm leaders everywhere. As time went on it was found that more and more of Wisconsin's soils were too low in this important plant food. In just the last 10 years, a vast area of heavy silt loam in north-central Wisconsin, known for years as the State's "Clover-land," has been found to be potash hungry. This area of Spencer silt loan soil comprises over 5,000 square miles, and it has long been regarded as one of the finest dairy regions of the State.

"Even the soils of southern and eastern Wisconsin, the most productive in the entire State, have shown a profitable response to potash in better than 60 per cent of the demonstrations conducted in the past five years," says Chapman. "The regular and systematic use of phosphate-potash fertilizers should be a part of every dairy farmer's program of soil-building."

"Only in the last five to ten years," says Chapman, "has the important role of nitrogen in the production of all farm crops really come to the front."

For years the State Soils Laboratory had shown a deficiency of nitrogen in almost 90 per cent of the soil samples tested. Every spring Wisconsin farmers had noticed the lush, dark green



A fertilizer demonstration with small grain (Vicland oats) on the Merwin Hawks farm near Ashland, Wisconsin. The plot on the right received 275 lbs. of 0-20-10 at time of seeding and yielded 72.6 bu. The check plot yielded only 33.8 bu.

patches of grass growing where cattle had added nitrogen to the soil. But despite this evidence, the widespread use of expensive nitrogen fertilizer was discouraged. This was for several reasons. In the first place, many agronomists felt that the effective return of crop residues and animal manures would go a long way toward replacing the nitrogen lost through the production of crops. Furthermore, the use of more legumes in the crop rotations gave evidence of being the most economical way of replenishing the soil's supply of this important plant food.

In the years just before the war, however, Chapman's demonstrations and the experimental work at the College of Agriculture led to the conclusion that up to 40 per cent of the plant-food nutrients in manures and crop residue was being lost through careless and ineffective methods of handling. It was also found that some fields on the average dairy farm received little, if any, of these "natural fertilizers."

"Then too," adds Chapman, "we became convinced that legumes were not maintaining an adequate supply of nitrogen for succeeding crops. At the same time, they were found to be drawing heavily on the available phosphate and potash of the soil; in fact, much more heavily than we had previously thought."

Applications of from 100 to 200 pounds of ammonium nitrate and ammonium sulfate per acre on Chapman's permanent pasture demonstrations have produced an additional profit of from $10 to $30 per acre, when compared with similar unfertilized pasture areas. These profit figures are based on actual milk production.

"It is quite evident now," asserts Chapman, "that the number one limiting element in the growth of pasture grasses is nitrogen. But this is only one of several places where nitrogen fertilizer may be used with profit on the average dairy farm."

He points with justifiable pride to the results of adding nitrogen fertilizer to timothy and clover "hay meadows" up in the Lake Superior district of northern Wisconsin. The average increase in yield for 27 one-acre demonstration plots was 2,185 pounds of hay. And the hay was leafier, darker green, and much higher in its protein content, the lat-

ter being an extremely important factor in better milk production during the long winter months.

Even the fall and spring grains, so important to dairy farm cropping programs, are beginning to show splendid increases where small applications of nitrogen are being used in addition to the conventional treatment of phosphate-potash fertilizer at time of seeding.

"There is the danger, of course, of producing too much straw," cautions Chapman, "and in dry seasons the new seedings of alfalfa and clover can be damaged. But with the new short stiff-strawed, high-yielding varieties of oats and judicious use of these nitrogen fertilizers, we have been able to obtain an added net profit of more than $5 per acre in northern Wisconsin with only 75 to 100 pounds of ammonium nitrate."

Running hand-in-hand with this great increase in the use of commercial plant food on Wisconsin soils has been Chapman's liming program for the acid soils of the State. Since 1935, nearly 12 million tons of liming materials have been added to enhance the growth of clover, alfalfa, and the small grains. Through liming, alfalfa now flourishes where it would otherwise have been difficult to even obtain a satisfactory "catch."

"Our liming job is still far from being done, however, says Chapman. "Tests show that more than 65 per cent of our crop and pasture land still has acid soil. Nearly 25 million additional tons of liming material will be needed to complete the 'once-over' job on the soils of our State."

The trend in the placement of fertilizer during Chapman's 30 years of work with Wisconsin soils is every bit as interesting as the story of the materials used. Methods of application, too, have greatly improved since 1916.

In the early days, broadcasting was the chief method used, and although it resulted in good increases in yield, it was nowhere nearly as effective and economical as the methods used later on. Then came the combination fertilizer-grain drill, commonly referred to as the "fertilizer drill" by farmers throughout the Midwest. This effi-

Corn experiment on the farm of O. D. Brace, Janesville, Wisconsin. Hill fertilizer alone yielded 35.1 bu., while the same hill application in addition to 825 lbs. of 8-8-8 on the plow-sole yielded 55.6 bu., an increase of over 60 per cent.

cient piece of machinery not only resulted in uniform and economical application of the fertilizer material, but also placed it at the right depth and at the right time for quickest response on the part of both the small grain and the new seeding. It could easily be adjusted for rate of application and could be operated easily and without extra trouble.

"It was largely because of our experiments and recommendations here in Wisconsin," says Chapman, "that the fertilizer attachment on the corn planter was redesigned and made into the efficient implement that it is today."

Even as late as 1930 most of the attachments simply dropped the fertilizer in the hill, with the seed and fertilizer going down together. The result was inefficient use of fertilizer and even damage to the sprouting seeds. The modern "split-boot" attachment of today not only deposits the fertilizer right at the hills, but also places it in two bands, on either side of the seed, where it cannot harm the germinating corn.

Deep Placement

In recent years, deeper placement of plant food for corn and certain other crops has shown up remarkably well in Wisconsin and in other Midwestern states. At the Indiana Station the "plow-under" method, using 800 to 1,500 pounds of 8-8-8 fertilizer, resulted in corn increases of more than 50 bushels to the acre on some of the worn-out, less fertile Indiana soils. It was found that those soils originally low in plant food and those receiving little or no manure or crop residue responded particularly well to this quick "rehabilitation" practice. The "plow-sole" method, wherein bands of this rich plant food are placed down on the furrow bottom at time of plowing, also produced more corn. This was particularly true when the top few inches of the soil became dry due to summer drought just at the time the growing plants needed the fertility most.

Chapman was quick to adapt these methods to Wisconsin soils and crops. During the past five years, he has conducted hundreds of plow-sole demonstrations all over the State, using about 800 pounds of 8-8-8 fertilizer per acre. Profitable increases, ranging from 10 to 70 bushels of corn per acre, have been the result.

"It's a good method for bringing worn-out fields back into production quickly," advises Chapman. "Furthermore, one-half of the phosphate and potash added is left in the soil for the benefit of crops to follow. Dairy farmers in this State have purchased thousands of plow-sole fertilizer attachments for their plows, and many are applying this plant food in the fall of the year, when there is more time available on the average farm.

"Some of the larger farmers are now finding the present plow-sole attachment, with its small hopper capacity, too slow for fertilizer application on large acreages," says Chapman, "but we expect the smaller dairy farmer to continue using the regular attachment for his plow."

Recently an effective deep fertilization machine has been devised by a corn grower in Central Illinois for farmers plowing large acreages. It places the fertilizer at plow-sole depth and can cover up to 30 acres a day. Chapman believes that the Thorp machine, with its large 500-pound-capacity hopper mounted on a field cultivator base, will be the answer to the objections of larger operators to placing the fertilizer at "root depth" in the soil. Others have objected to the expense of such heavy applications of a high-nitrogen mixture.

"Here again," explains Chapman, "the answer is pretty much up to the judgment and experience of the individual farmer. He must carefully consider the price for his crop, the amount and cost of fertilizer per acre, and the increases which he is able to obtain through fertilizer application. These will give him the answer as to

(*Turn to page* 44)

Potash Meets Its Responsibilities

(Reprinted from Commercial Fertilizer, November 1946)

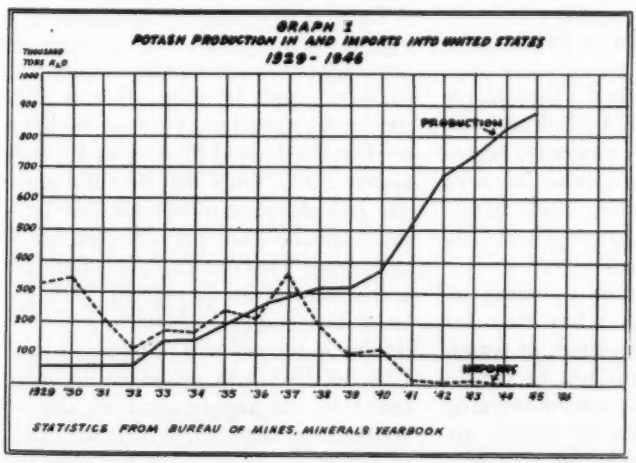
By Dr. H. B. Mann

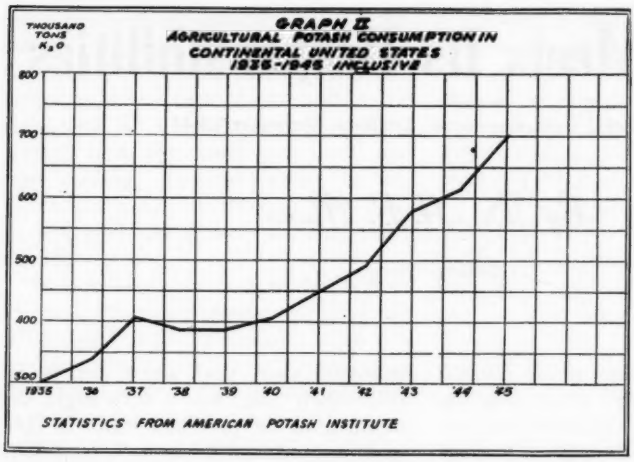
Atlanta, Georgia

POTASH production in the United States again reached a new high in 1945. Deliveries for the calendar year amounted to 1,583,473 tons of potash salts, containing 868,168 tons of K_2O. This is an increase of 52,351 tons in 1945 over 1944 and represents a gain of 6.4 per cent. Alone these figures are impressive, but their full significance can best be appreciated by reviewing briefly production changes in the American potash industry since World War I.

In 1919 U. S. production declined from 54,803 tons in 1918 to 32,474 tons. Not until 1929 did American production reach 60,000 tons, where it was fairly constant until 1933. That year, largely due to development of the Carlsbad, New Mexico deposits, production jumped to 143,378 tons and has increased each year since, except in 1939 when there was a very slight decrease from the previous year. In contrast, imports in 1929 were 324,638 tons K_2O, over five times the U. S. production. Imports decreased rapidly from 1930 to 1932 and ran fairly close to domestic production through 1937, when they again took a sharp decline, ceasing to be a factor after 1940. With substantially all imports cut off, American producers were called on to meet the requirements of the United States and other countries of the American hemispheres as well as many of those of our allies across the oceans. The record of production is shown in graph 1. The increase is from 61,590 tons K_2O in 1929 to 868,168 in 1945.

Thus the American potash industry has met its responsibility in supplying the requirements of agriculture and industry including the needs of this country and our allies while at war. Now as we adjust to peace, the producers are making every effort to meet the unprecedented demands of the nation's farmers despite the shortages incident to peacetime conversion.





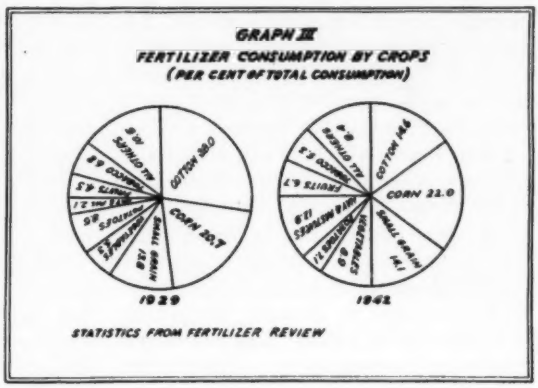
The greatly increased requirements for potash in agriculture shown in graph II are due largely to changes in farming practices and the use of fertilizer to meet the situation which has developed. Perhaps the most important change in its effect on fertilizer has been the shift from cotton to other crops. It will be noted from graph III that whereas in 1929 28 per cent of the fertilizer used in this country was applied to cotton, in 1943 this figure had dropped to less than 15 per cent. The land which was retired from cotton production is now being planted to peanuts, small grains, fruits and vegetables, hay crops, and pastures. In contrast to cotton, until recently little attention has been given to the fertilization of these crops yet they remove large quantities of plant food, particularly potash, from the soil. Agricultural officials have found and farmers are beginning to realize that if production is to be maintained, the plant food that is taken from the land by crops and livestock must be replaced.

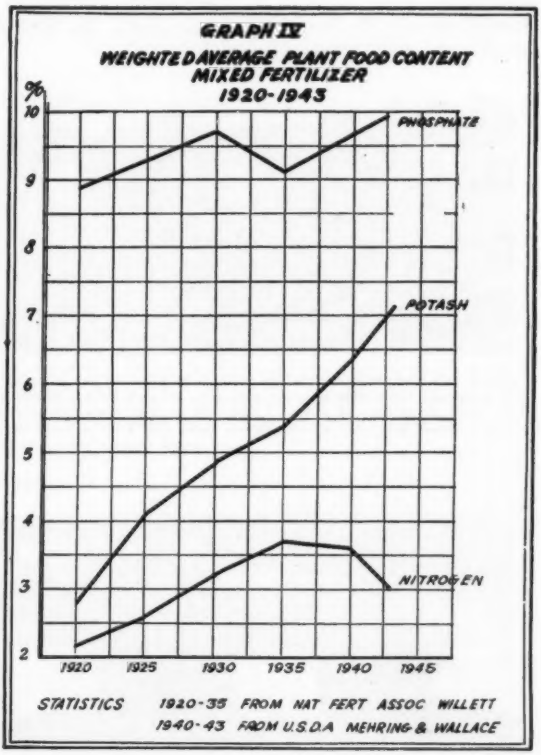
Alfalfa, which is now assuming increased importance as a hay crop, for example, removes 135 pounds of potash in normal crop. Thus just to replace the potash removed by a three-ton crop of alfalfa will require an annual application of 675 pounds per acre of a fertilizer containing 20 per cent K_2O. A 25-bushel crop of soybeans with the leaves and stems requires 60 pounds of potash, the equivalent of 600 pounds per acre of a fertilizer containing 10 per cent K_2O. Corn is not generally recognized as requiring heavy mineral fertilization, yet a 60-bushel crop with two tons of stover will remove from the soil the amount of potash contained in a 700-pound-per-acre application of a 5-10-10 mixture. Peanuts take out of the soil 50 pounds per acre of K_2O, sweet potatoes 115 pounds, tomatoes 175 pounds, tobacco 115 pounds, wheat including grain and straw 30 pounds, and cabbage 100 pounds in good crop years. In addition, enormous quantities of potash are lost each year by erosion and leaching. Thus, it is not surprising that both plant-deficiency symptoms and chemical soil tests show we are rapidly depleting the available potash in a large percentage of our cultivated soils.

To meet this problem, fertilizers containing more potash are gaining in popularity throughout the country. A study of graph IV shows that in 1920 the average analysis of mixed fertilizer used in the United States was approximately 2-9-3. Since that time the nitrogen and phosphorus contents have been increased about one per cent each, while the potash has been increased four per cent, making the average in 1943, the latest data available, about 3-10-7. The decline in the per cent of nitrogen from 1940 to 1943 was undoubtedly influenced by the supply situation due to wartime restrictions. While the ratio of potash in mixed goods has gone up,

the average application per acre has likewise been raised substantially. To these changes can be attributed the greatly increased demand for potash in sections of the country where the use of fertilizer has been long established. In addition, vast areas in which the practice has been to use little or no plant food, notably the Midwest and Southwest, have come into fertilizer usage in recent years. This has brought new demands and has been an important factor in the constantly increasing use of potash.

The question is often raised as to whether or not the rapid changes that have taken place in the use of potash are agronomically sound and economically justified. The answer is given in reports of agronomists and other official agriculturists throughout the country. In North Carolina, to determine the importance of K_2O in the production of relatively heavily fertilized crops such as Irish potatoes, sweet potatoes, and cotton, Cummings made comparisons between applications of potash corresponding to experiment station recommendations for these crops and smaller applications which were nearer to the amounts farmers were using at the time. No comparisons were made against plots which received no potash. Thus his findings were calculated to show what a farmer might expect if he increased his potash applications up to the experiment station recommendations. It was found that the yield response to one ton of K_2O used in this manner in the principal potato-producing area of North Carolina was 26,800 pounds Irish potatoes and that of sweet potatoes 87,300 pounds. In 12 cotton experiments conducted in the four principal cotton areas of the State, the yield response to one ton of K_2O varied from 4,640 pounds to 13,035 pounds seed cotton. On pastures which have until recently received little attention,





the response in the mountain area of North Carolina was 9.6 tons dry forage, in the upper coastal plain 24.1 tons, and the lower coastal plain 21.5 tons.

In South Carolina, Garman calculated from a series of experiments at the Sandhill Experiment Station that a farmer having similar soils with 80 acres of cotton could expect an increased income of $1,403 merely by applying with his nitrogen and phosphate 30 pounds K_2O per acre instead of 15 pounds. Similar calculations from cooperative tests with farmers on the Piedmont soils of the State showed a return of $943 after deducting the cost of the potash. On soils of the Pee Dee Experiment Station known to be especially deficient in potash, the return was $3,670 for one ton of 60 per cent muriate of potash used to increase the potash in a 5-10-2.5 to 5-10-5. Returns in the Southwest have not been as spectacular; however, from a series of experiments conducted with cotton in Louisiana, Sturgis reports the net profit from a ton of 60 per cent muriate of potash varied from $75 on the Mississippi river bottoms which are high in available potash to $407.70 on the Coastal prairies.

The importance of potash in the production of corn in the Midwest has been generally recognized. Bray of Illinois reports that corn has a higher requirement for both soil potash and added potash than either soybeans or wheat. On soils low in available potash he found that the addition of 72 pounds K_2O per acre with the recommended applications to other crops in the rotation could be expected to almost double the yield of corn. On soils with a higher content of available potash, increases were less but quite significant.

On the other hand, in the South the response of corn to potash fertilization has been inconsistent and often very slight even on the sandy soils of the Coastal Plain except where they were very low in available potash. The new program of corn production sponsored by Krantz, however, has shown that in

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Above: Cotton rust controlled with 100 pounds per acre of muriate of potash. Field fertilized at planting with 400 pounds per acre of a 4-10-4. Right top-dressed June 8 with 100 pounds per acre of nitrate of soda. Yield 740 pounds seed cotton per acre. Left top-dressed June 8 with 100 pounds per acre of nitrate of soda and 100 pounds muriate of potash. Yield 1,260 pounds seed cotton per acre.

Below: Potash improves the quality of and increases the yield of alfalfa.

Hereford cattle graze good pasture of Bermuda grass, native bluestem, and clover on the Walker Jones farm in the Verdi-Grand Soil Conservation District at Wagoner, Oklahoma. The pasture has been fertilized and mowed.

Good Pastures Conserve And Pay

By W. M. Nixon

Regional Agronomist, Soil Conservation Service, Fort Worth, Texas

ONE of the most important of the many dovetailing soil and moisture conservation measures used by farmers cooperating with soil conservation districts is pasture development and management. The district cooperators, working with the aid of Soil Conservation Service technicians, have found that when the land is producing good pasture, soil and water losses are held to a minimum, and returns are high in comparison with other land uses.

The experience of Walker Jones, cooperator with the Verdi-Grand Soil Conservation District near Wagoner, Oklahoma, is representative. In his estimation, pasture is a much better risk on his farm than clean-tilled crops. Three successive years of poor crop yields and low income on his 440-acre farm prior to 1939 convinced him of that.

Jones' farm cost him only $15 an acre, but he knew he was losing money when his run-down land averaged only 10 bushels of corn and eight bushels of wheat an acre. He decided then, in 1939, that the time had come for him to make a change. He contacted the local Soil Conservation Service technicians assigned to the Verdi-Grand District and asked help in turning his farm to pasture so that he could concentrate on raising livestock. With the technicians he went over the entire farm and worked out a plan of conservation operations which would allow him to turn to pasture in a way calculated to make the best use of each acre on the place.

Then, he began his pasture improvement. He over-seeded 300 acres with Korean lespedeza, yellow hop clover, white clover, and rye grass. Some native bluestem grass and Bermuda grass already was present when he started.

Both have spread considerably. An average of 100 tons of barnyard manure has been put on this pasture land during each of the past three years. More than 300 tons of agricultural limestone and 16 tons of superphosphate also have been applied to the grasses. His pasture now carries an average of one head of livestock per acre for eight months during the year.

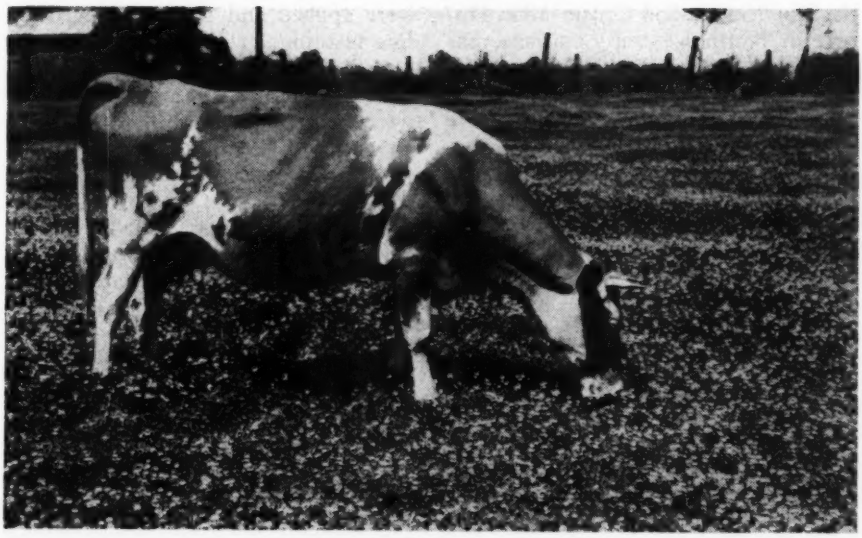
Jones still has some cultivated land—about 95 acres. He and the technicians agreed that he could grow crops profitably on those particular acres. Just as he follows conservation pasture improvement methods including mowing and rotation and deferred grazing, he uses needed conservation measures on his cropland.

Measures in effect on the place include diversions to keep water from rushing over areas which might wash and gully easily, terraces, terrace outlets, contour cultivation, contour sodding, planting a postlot, and building two farm ponds. Barnyard manure is applied regularly on the cropland in about the same proportion as on the pasture. A soil-improving legume is used regularly in the conservation crop rotation. He gets a bale to the acre now, where cotton made 150 pounds of lint an acre before 1939. His wheat produces 15 bushels to the acre instead of the former 8-bushel yield he used to get. Corn yield has jumped from 10 bushels per acre prior to 1939 to 30 bushels now.

When he began conservation farming Jones had 40 grade Hereford cows, 30 calves, and seven horses. He has sold most of the grade stock and replaced them with registered Herefords. His herd numbers 103 cattle. Other stock on the place includes several registered Belgian mares, stallions, registered jacks and jennies, several quarter horses, a flock of bronze turkeys, 100 high-grade sheep, and several registered rams.

In 1944 Jones' income from sales on his 440-acre farm was $7,091.07, while his expenses, chiefly for protein feeds, were $3,864.88. That left him a net income from sales of $3,226.19—that much profit on land that cost him $15 an acre. Jones believes his six years of conservation farming have doubled

Purebred Jersey dairy cattle on the Alfred Austin farm in the Benton County Soil Conservation District, near Maysville, Arkansas. The cattle, along with a few black-faced sheep, are shown grazing improved pasture of rye grass, hop clover, lespedeza, white clover, and ladino clover. The pasture averages over an animal unit of grazing per acre throughout the season.



The cost of building this improved pasture where the young Guernsey is grazing on the W. R. and J. B. Cutrer farm at Kentwood, Louisiana, in the Bogue Chitto-Pearl River Soil Conservation District was $17 an acre, not including the labor. The plants are clover and Dallis grass. The pasture had had the benefit of a complete fertilizer. Cattle graze the field continuously except when removed for the short time necessary to let the clovers and grass re-seed. Milk production jumped from below 300 lbs. daily to more than 600 when cattle were turned on the pasture. Feed bills dropped, and the Cutrers report the cows have no trouble at calving time now.

the value of his farm; certainly conservation farming has controlled erosion and improved fertility.

J. P. Seal's results with improving pastures in the Bogue Chitto-Pearl River Soil Conservation District at Franklinton, Louisiana, is another proof that returns from land producing good pasture are high in comparison with other land uses. Seal, who has developed his pasture with the help of Soil Conservation Service technicians assigned to the district, sold 16 four-month-old calves, averaging 360 pounds, for $60 each after they had pastured his improved grassland. His yearling native cattle raised in piney woods pasture brought him only $23 a head.

A 37-acre pasture improved by fertilizing, mowing, and seeding Bermuda grass and white dutch clover is paying off for F. L. Thompson of Leona, Texas, a cooperator with the Bedias Creek Soil Conservation District, by furnishing him year-round grazing for 32 head of livestock. The cattle on the 37 acres average 200 pounds heavier than Thompson's cattle which graze unimproved grassland. The heavier cattle have a slicked-off, glossy-haired look that the other stock do not show. Calves raised on the improved pasture brought Thompson two cents a pound more on the Fort Worth market than he was able to get for his calves raised on unimproved grassland.

At Cabot in the East Central Arkansas Soil Conservation District, farm operators, E. G. and W. G. Spence, say they had to borrow money every year while they were still trying to row-crop their farm. Careful examination revealed their acres are much better suited for dairy farming than for raising cultivated crops, and so they set to work building improved pastures and obtaining milk cows. Their change in land use has proved wise. Now, instead of owing money, they are out of debt and are the owners of 65 dairy cattle and 10 registered Herefords. The dairy cows average 1,100 to 1,200 pounds of milk annually.

A. J. Battle, a negro cooperator with

the Dugdemona Soil Conservation District in North Central Louisiana, has established a good pasture in one year. Don Spencer, Soil Conservation Service technician whose work unit gave technical assistance to Battle, states that it is one of the best first-year pastures that has been established in the District. The following procedure was followed in the development of the pasture:

1. Soil Conservation Service technicians assisted Battle in the preparation of a complete soil and moisture plan for his farm, which included proper land use.

2. It was determined that old pasture which consisted primarily of carpet grass and weeds would be improved.

3. Soil samples were taken and sent to the soils laboratory at Louisiana State University for analysis. The analysis showed that Battle should use 2,000 pounds limestone, 400 pounds superphosphate, and 100 pounds K_2O muriate of potash per acre.

4. The lime, potash, and phosphate were applied and the land disced before planting.

5. Ten pounds of a mixture of equal parts of hop, Persian, and white clover were sown on October 14, 1945.

6. April 1, 1946 a top-dressing of 50 pounds of muriate of potash per acre was applied.

7. Grazing was restricted April 1, and was begun again on April 25.

Many district cooperators are improving their pastures in the same manner as Battle. By fertilizing, liming, and seeding clovers early, grazing is provided. It is very important that all of the essential practices be followed very closely. Omitting any one of them such as liming, phosphating, potashing, seedbed preparation or seeding is very likely to result in failure or partial failure. Lespedeza, properly fertilized, provides grazing during the summer months.

Management of pasture, the second important phase, involves stocking the pasture with the proper number of ani-

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This picture shows extra growth obtained by using potash at the rate of about 500 lbs. per acre. (Note two samples in hands of Mr. A. C. Morris, District Conservationist of Dugdemona Soil Conservation District. The one in his right hand was taken from an area where 50 lbs. potash and the one in his left where about 500 lbs. potash per acre were added.) The high-potashed area yielded about four times the green matter produced by the area which had only 50 lbs. It is not believed that this heavy an application of potash is needed, however, it does indicate, in this case, a need for more than 50 lbs. per acre.

Fig. 1. G. L. F. truck spreading bulk fertilizer to cover crop.

Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop

By Benjamin Wolf

Soil Chemist, Seabrook Farms Company, Bridgeton, New Jersey

EXPERIMENTS conducted by the G.L.F.-Seabrook Farms Raw Products Research Division in South Jersey have indicated that it is possible to fertilize peas and perhaps other crops as well by applying fertilizer to the preceding cover crop in the fall or late winter.

There are several advantages to such a system. The fertilizer can be applied during relatively slack periods thus reducing delay during the spring rush for application of fertilizer. With a crop such as peas which has to be grown in a relatively cool climate, the saving of several days during planting season can help to insure better yields. There is the advantage of increased organic matter, due to the supply of sufficient nutrients to the cover crop.

The actual increase of soil organic matter in any one year is small due to such fertilization but from the standpoint of cover and possible long-time effects, it is definitely important. In some cases, the dry weights of non-leguminous cover crops have been doubled by the application of fertilizer to the cover crop. The cover crop takes up the nutrients supplied and converts at least a part of them to organic forms which are released slowly. The method of applying fertilizers to the cover crops is, therefore, a means of converting cheap inorganic nitrogen to expensive organic forms.

Bulk Fertilizer Spreading

There are advantages also from the standpoint of fertilizer handling and therefore costs. Application of fertilizer to the cover crop with its lengthier period of application makes it feasible to use large heavy-duty equipment for bulk fertilizer spreading. The Co-op G.L.F. Soil Building Service Inc., Ithaca, N. Y., has been pioneering with equipment that can spread bulk fertilizer directly to the fields. Five to eight tons of fertilizer in bulk are loaded at the plant on a modified truck. This truck spreader is so designed as to provide a uniform feed at whatever field working speed the truck can be driven. The twin distributing fans are driven by an auxiliary motor to insure a uniform width of spread. The rate of application is determined by the size of the feed-gate opening, and the width of the "land" the operator selects. (Fig. 1 and 2.)

Handling fertilizer in bulk eliminates the cost of bags and costly handling. Moving bulk fertilizer as soon as it is manufactured saves considerable storage space in the fertilizer plant. With a lengthy season of application made possible by cover crop fertilization, it is much easier to keep the fertilizer moving. No lengthy curing of the fertilizer is necessary, for it is delivered to the farmer and spread before the fertilizer has "set up" to any serious extent.

The savings in bags, storage, and handling can mean a cheaper fertilizer for farmers. At present, the fertilizer is being delivered and spread on the field for somewhat more than the farmer would have to pay for the delivered bagged fertilizer. This may be reduced in time as equipment is kept busy and saving in storage space can be properly evaluated.

Need for Cover Crop Fertilization

For some time it has been known that full advantage of applied fertilizer to soils is often not fully taken unless there is sufficient organic matter present. A recent paper by App and Wolf* showed the presence of sufficient organic matter to be one of the prerequisites for high yields of certain vegetable crops. In soils receiving little or no manure

* "The influence of soil pH and organic matter upon the yield of some vegetable crops" by Frank App and Benjamin Wolf, Proc. Amer. Soc. Hort. Sci., 46, 309-319, 1945.

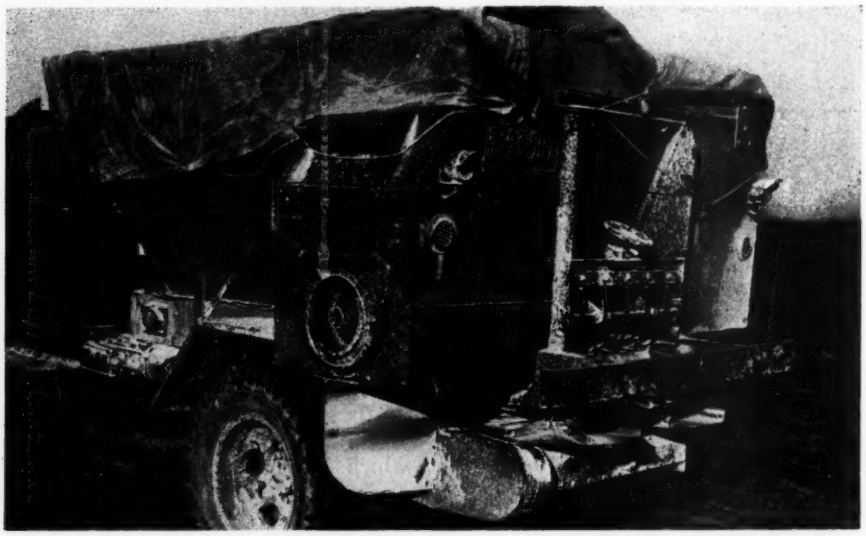

Fig. 2. Close-up of truck. Note enclosed motor at left rear, prongs to break up fertilizer as it falls on fan blades, crank for making adjustments of rate.

TABLE 1.—THE YIELDS OF COVER CROPS TOP-DRESSED WITH NITRATE OF SODA[1] AND OF THE SPINACH WHICH FOLLOWED

Trial	Date of Nitrate App.	Date Harvested	Yield [2]	Spinach Yield [2]
			% Change due to N	% Change due to N fert. of cover
Rye Cover Crop				
1	3/8/44	3/24/44	+9	−6
2	3/8/44	3/24/44	+22 [3]	+33 [3]
3	3/3/44	4/3/44	+25 [3]	+42 [3]
4	3/8/44	4/4/44	+14	+25 [3]
5	3/8/44	4/10/44	+37 [3]	+8
6	2/25/44	4/13/44	+100 [3]	+33 [3]
7	3/3/44	4/20/44	+97 [3]	+37 [3]
8	2/25/44	4/20/44	+165 [3]	+67 [3]
9	2/25/44	4/20/44	+104 [3]	+67 [3]
10	2/25/44	4/20/44	+50 [3]	+41 [3]
11	2/25/44	4/20/44	+119 [3]	+110 [3]
Rye Grass Cover Crop				
12	2/25/44	4/17/44	+11	0
13	2/25/44	4/17/44	+34 [3]	−15
14	2/25/44	4/20/44	+34 [3]	+4
15	2/25/44	4/20/44	+63 [3]	+16

[1] One hundred lbs. per acre.
[2] Cover crop yield based on dry wt. of five samples; that of spinach on fresh wt. of four samples.
[3] Significant differences.

the cover crop is an important source of organic matter. Not only does it supply organic matter but it helps conserve organic matter in the soil by reducing erosion. It is also about the cheapest form of organic matter that is available for farmers.

Unfortunately when cover crops are plowed early, the amount of organic matter formed is small and it rapidly decomposes. Anything which will increase the yield of cover crop would in the long run be advantageous from standpoint of organic matter production and conservation.

In a study of amounts of dry matter produced by various cover crops, it soon became apparent that poor soils produced poor cover crops. It was ironical that the soil-improving crops did the least amount of improvement on soils that needed it the most. This was especially true for the non-leguminous cover crops, rye and rye grass, which are grown extensively in the area. For rye this was especially serious since in many areas the cash crop comes off so late that no other cover crop than rye is feasible.

Many soil tests showed that growth of rye and rye grass was most often limited by lack of nitrogen and in some cases by insufficient phosphorus and potassium. It was thought, therefore, that cover crop yields could be materially increased by additions of complete fertilizer or at least of nitrogen.

Experimental Work

1943-44 results. The first work done by the Division with fertilization of cover crops dealt with the application

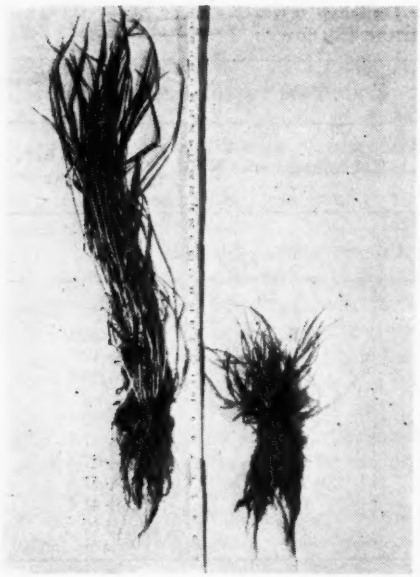

Fig. 3. The effect of nitrogen fertilization of rye grass. Left, 60 lbs. of N per acre, check on right. Note that stimulation of the top of plant on left has been at some expense of root growth. However, total yield is greater in case of treated plant.

of nitrogen during the late winter months of 1944. Nitrate of soda at the rate of 100 lbs. per acre was applied to rye and rye grass. Samples for dry weight of both tops and roots were removed just prior to plowing. At the same time a representative area of cover crop and soil on which it was grown was placed in pots. The pots were exposed to atmospheric conditions and later planted to spinach. An application of 4-12-8 fertilizer equivalent to 1,500 lbs. per acre was applied to all pots before planting spinach. The yields of cover crops and spinach which followed are given in Table 1.

The results in Table 1 indicate that there was a marked response by cover crops to winter applications of nitrogen. The extent of response was somewhat dependent upon the time between application date and harvest date. The yields of rye grass were much less affected. Part of this may be due to the fact that extra nitrogen stimulated top growth at the expense of some root growth in this crop (Fig. 3).

The yield of spinach on rye cover crop was generally beneficially influenced by applications of nitrogen to the cover. When supplied with sufficient moisture, spinach requires more than 60 lbs. of applied nitrogen per acre. Therefore, in nearly all cases there was a response to the extra nitrogen. This was not the case with rye grass. The exact reason for this is not known although it may be due to greater nitrogen demand for decomposing the larger yields of a woodier plant material.

1944-45 results. The marked responses in the above trials prompted further and more detailed experiments. These established in the fall of 1944 on 16 different fields were designed to note the affect of the three major nutrients on cover crop growth, the relative effectiveness of applying nitrogen in fall or spring, and the value of cover crop fertilization as compared to fertilization just prior to planting. On most fields there was a noticeable difference within 10 days in color of cover crop wherever N or mixed fertilizer was used. By early March, the difference in growth was quite striking (Fig. 4). The treated cover crop was a very efficient cover (Fig. 5). Again yields of cover crop were obtained by harvesting representative square foot areas and washing soil from roots. Samples of cover crop and soil were placed in pots (Fig. 6) and in this case were planted to peas. Peas at harvest time are shown in Fig. 7. Results are given in Table 2.

These results confirmed the previous experimental data and gave new data to support the method of cover crop fertilization. It is of extreme interest that the yields of peas were as good following fertilized cover crops as those receiving fertilizer before planting. Examination of young seedlings showed that better growth was being made where fertilizer was applied to the cover crop especially in the double nitrogen and mixed fertilizer treatments. These early differences disappeared at a later

Fig. 4. Rye grass in cover crop fertilization experiment photographed in March 1945. Check in foreground; treated areas in background. From left to right, NPK, 2N, K, and P. Stakes between 2N and K have been removed but line is clearly visible. Treatments applied October 1944 except 2N plots which received one-half N in October 1944 and one-half in late February 1945.

date. Lima beans which followed but which received no additional fertilizer gave somewhat similar results as peas.

There was evidently no response to the additional organic matter produced which in several cases amounted to about two tons of dry matter per acre. Of course, this amount compared to the total soil organic matter present is very small (Two tons = 0.2% and these soils ranged from 1.0-1.6%). If such increases were obtained for a number of years on the same soil, it

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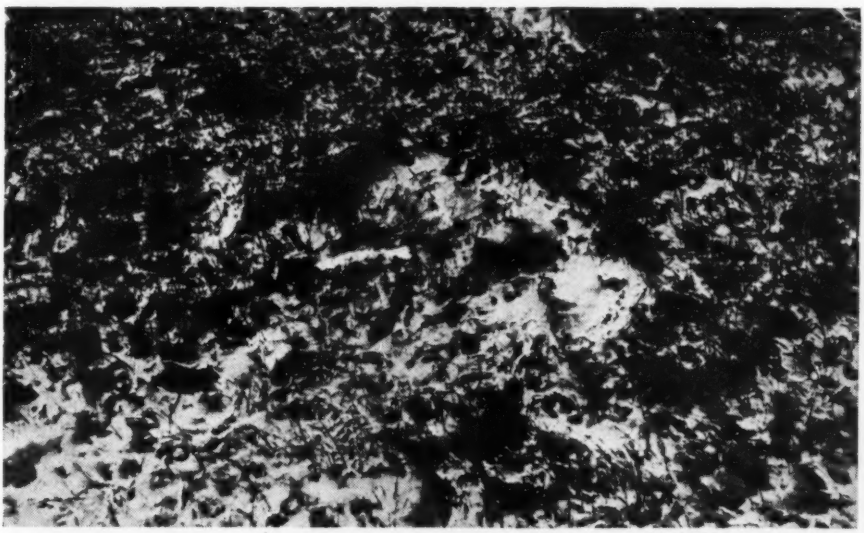

Fig. 5. Close-up of cover crop treated several months earlier with mixed fertilizer. Note how tall cover crop holds snow in place.

Left to right: Samuel W. Hill, FSA supervisor; Alton G. Wilson, farm owner; and Grady Wise, soil conservationist of Soil Conservation Service. Picture made in meadow strip.

Farm Security Administration Gave Me My Start

By Alton G. Wilson

Reidsville, North Carolina

I WAS BORN and raised on a farm in Rockingham County and my forefathers were farmers. In my youth I had a firm desire to own and operate a farm and put into practice better farming methods. Upon reaching the age of 21, my father's family of four boys had outgrown the 68-acre farm, and I, being the eldest, was free to seek employment elsewhere. This was in the early 1930's and wherever I turned for work there was a "No Help" sign hanging out. After many days of employment-seeking, I was forced to return home. After bargaining with one of our neighbors, who was badly in need of help, I became another of the many thousands of share-croppers in North Carolina.

In July a hail storm harvested our crop. Again I was forced out into the world seeking employment wherever it could be found. A friend told me that I might find work at a peach orchard in and around Southern Pines, and immediately I set sail, by thumb, with $2.00 given me by my uncle in my pocket. After buying a pair of work pants for $1.00, I reached White Hill, N. C., two days later, with two cents in my pocket. There I landed a job with the big pay of $3.00 per week and board, which made me very happy.

For five years I remained in this section of the State as a share-cropper. In 1938 I moved to Guilford County and farmed on shares with my cousin. It was on this farm that I first saw farm-

ing practices advocated by the Soil Conservation Service being carried out. These practices appealed to me very much. One day I read in the paper an article about a tenant farmer purchasing a farm through the Farm Security Administration. I did not say much about this but did store it in the back of my head, for I was thinking that some day I might marry and purchase a farm through that agency even though it was unbelievable that a share-cropper could buy a farm without the price. In 1939 I moved back to Rockingham County.

On January 8, 1940, I took unto myself a wife and moved out on a farm I had rented from William Cummings, who was a fine Christian gentleman and who gave me much helpful advice. He also had a wonderful wife, who was very kind and good to us.

It was on this farm that I again came into contact with farm practices that were being advocated by Soil Conservation Service and I liked them and could see the advantage of such farming methods.

One day I had a long talk with Mr. Cummings and told him what was on my mind, particularly about wanting a farm of my own. He advised me to contact the local Farm Security Administration and file an application with them to purchase a farm even though I had rented from him another year. That night my wife and I talked it over. I told her if we were going to continue to farm that we should have one of our own so we could make a better home for our children and have security in our old age. The children would have a place to come to after they were married and their children could visit us. So on April 2, 1941, I went to the local Farm Security Administration office and filed my application to purchase a farm.

August 8, 1941, was surely a Red Letter Day in our lives as on that date I purchased a farm through Farm Security Administration and, in addition, borrowed over $1,000 for stock, tools, fertilizer, seed, etc. That was a great debt for me, more than $5,000 Uncle Sam was gambling on Alton G. Wilson to make good. I was gambling on my farm to make good for me as every farmer does and as everyone gambles that the farmer will win with Mother Nature, thereby producing the needed food and fiber for them.

I believed I could only be successful if I used and followed the better farm practices and proper fertilization. This farm I had bought was badly eroded and in a poor state of cultivation. I immediately contacted Soil Conservation Service and a date was made with their county unit supervisor to visit me. Together with the County FSA Supervisor and the Soil Conservation Service work unit leader, I walked over my farm and a complete farm plan was mapped out that included proper soil management by rotation, strip cropping, contour tillage, terraces, meadow strips, pasture, and fertilization, which all hoped would

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Close-up of good red clover on land that has been well-limed, and had phosphate and potash added.

The Use of Dipicrylamine In Tissue Testing for Potash

By A. C. Richer

Department of Agronomy, Pennsylvania State College, State College, Pennsylvania

IN applying the filter paper technique of tissue testing for potassium according to Hoffer's (1) modification of the original Purdue tissue-testing procedure (2), the sodium cobaltinitrite and ethyl alcohol reagents sometimes give erratic results. The difficulties encountered in estimating potassium, with reagents have been discussed by Peech and English (3) and it is well known that age of reagent, method of shaking, temperature, and amounts of reagents used, affect the degree of turbidity obtained. Under controlled conditions, such as exist in the laboratory, reproducible results can be obtained with cobaltinitrite, but tissue testing under field conditions often represents a variety of conditions.

The use of dipicrylamine for the determination of potassium lends itself well to the filter paper technique and eliminates these difficulties. The test was originally designed by Poluektoff (4) and is described in several texts on delicate spot testing (5, 6).

Reagents and Procedure

Reagent No. 1. One gram of dipicrylamine (hexanitro-diphenylamine) is dissolved in 100 cc of boiling 0.1 normal sodium carbonate solution, allowed to cool, and filtered.

Reagent No. 2. Two normal hydrochloric acid solution.

For convenience in use the reagents are stored in dropping bottles.

Procedure:

Filter paper is saturated with plant sap according to the procedure of Hoffer (1), and a strip ½ to ¾ inch wide is cut from the bottom for the test. (The remainder of the filter paper may be used for nitrate and phosphate tests if desired). One drop or less of reagent No. 1 is smeared over an area of several square centimeters using the tip of the dropping bottle dropper, and then 1 or 2 drops of reagent No. 2 are smeared over the same area with its dropper. In the presence of potassium, an orange red fleck is formed which is not decolorized by the addition of the hydrochloric acid solution. If no potassium is present, the color fades to a sulfur-yellow.

Excess of reagent No. 1 should be avoided in making the original smear. Just enough should be smeared on the paper so that it is absorbed uniformly over the area tested without any free solution standing on the paper before reagent No. 2 is added. Otherwise, when reagent No. 2 is added a milky yellow precipitate may form which will partially mask any orange flecks on the paper.

Contact of the dipicrylamine reagent with the skin should be avoided since the reagent is poisonous.

Interpretation:

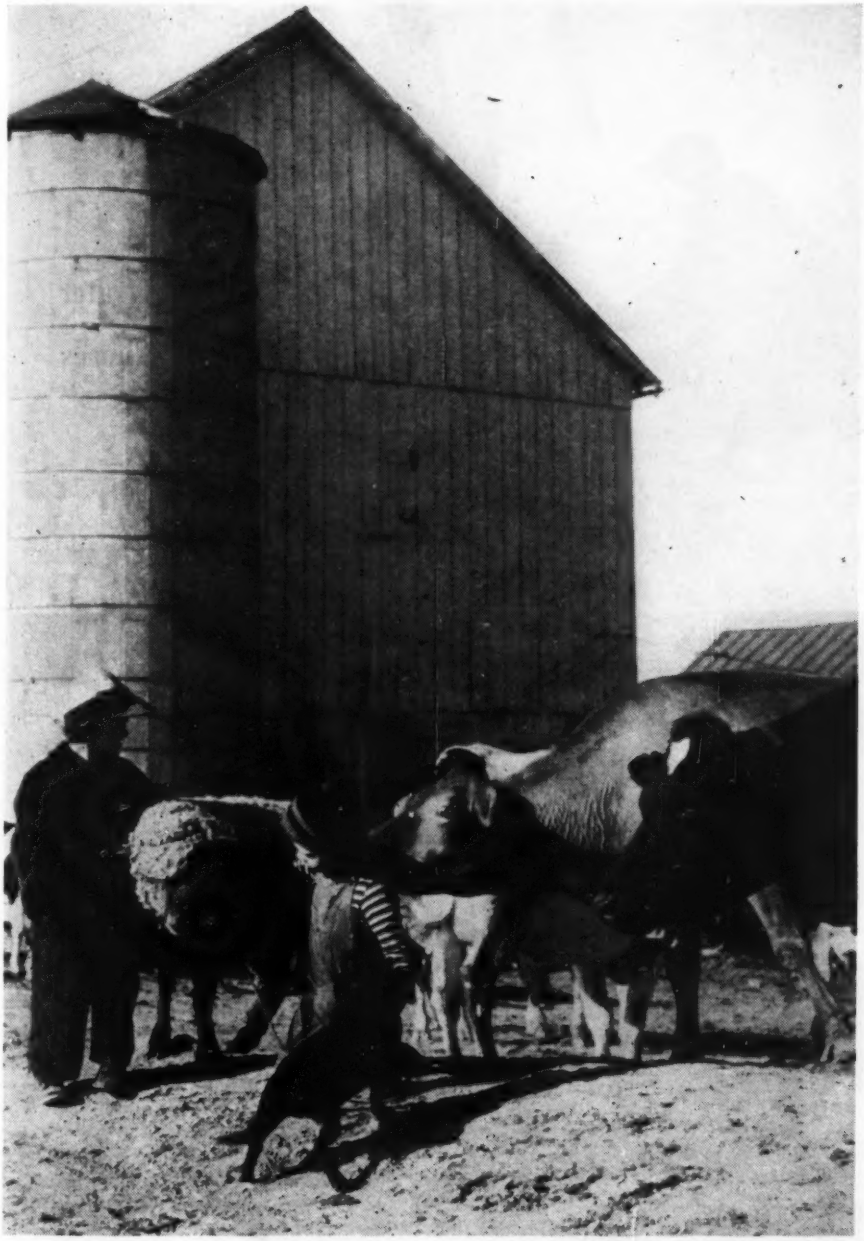
The test is made semiquantitative by arbitrarily setting the following standards for evaluation of the level of potassium.

0=pale sulfur yellow, no orange flecks=No potassium.

1=few orange flecks=Low potassium.

(*Turn to page* 42)

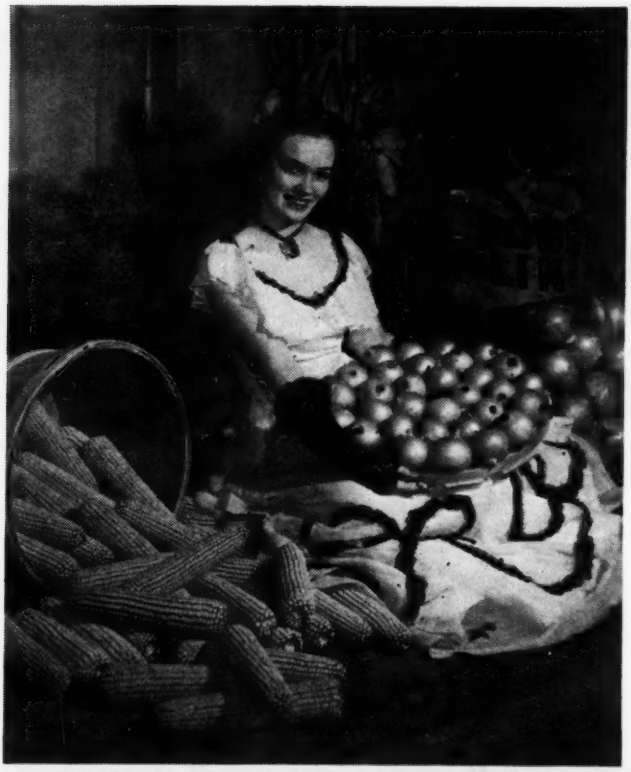
PICTORIAL



Farm children seldom lack pets of their own choosing.

Winter Chores

In Northern States



Left: Miss Carol Mitchell, Rochester, Indiana, Queen of the 14th Annual Indiana Muck Crop Show held at North Judson, Indiana. Carol spent considerable time in the onion fields this summer weeding onions on her father's farm.

Below: Whitney Gast, Akron, Indiana, Muck Crop farmer was crowned the Muck Crop Champion of Indiana for 1946 by Governor Ralph Gates. Mr. Gast produced 1,029 bushels of onions, 560 bushels of potatoes, and 117 bushels of corn per acre.

The Editors Talk

Agriculture 1947

Encouraged by a continuing strong domestic and export demand for farm products and a favorable price situation, American farmers are starting the new year with plans for high production records. Officially announced goals for 1947 call for another year of top farm output. It is safe to predict that with "breaks" in the weather and farmers still in wartime "gear" these goals will be achieved.

The total acreage called for—358.5 million, of which 297.5 million are for cultivated crops and the balance for hay crops—is about 3 per cent more than the 1946 actual acreage, which turned out America's all-time production record. According to the Bureau of Agricultural Economics, U. S. Department of Agriculture, this acreage is larger than is permanently desirable and many farmers who want to restore fertility reserves drawn on heavily during the war will once more have to change their plans. In view of the heavy drain intertilled crops make on soil resources and the resulting intense competition for use of land in some areas, farmers will examine goals very closely in relation to good land use. There will be cases where a decision on priority of commodities will have to be made, such as wheat or flaxseed, cotton or grain sorghums, dry beans or sugar beets. Farmers will want to reconsider their plans for planting spring wheat, in view of the need for flaxseed and the excellent condition of the large acreage of winter wheat.

Four important reasons for continuing heavy production in 1947 have been given. First, there is a strong domestic demand. Second, there is need to build up reserve stocks of some commodities depleted during the war. Third, many war-devastated areas are still critically short of food and other farm products which America can supply. Fourth, a margin of safety should be allowed for the possibility of less favorable weather and lower yields than have prevailed in recent years.

"In view of the severe world shortage of such commodities as fats and oils, sugar, and some of the cereals, maximum domestic production of these commodities is desired so that more supplies which might otherwise be shipped to the United States will be available for other countries," the Bureau states.

"This does not mean there is an unlimited demand for all farm commodities. The goals suggest cuts in the acreage of some crops. By exceeding the goals, especially for potatoes, peanuts, and burley tobacco, farmers could easily overproduce and bring on serious marketing difficulties. Substantial reductions in acreage of certain war-emphasized crops will be needed in some areas, while in others the suggested changes in crop goals call for acreage expansion. Greatest expansions over 1946 acreages are in cotton, flaxseed, dry beans, soybeans, barley, and grain sorghums. Continuation of the high wartime level of production is indicated for wheat, rice, and sugar crops."

On livestock, the goal calls for a slaughter of 34.5 million head of beef cattle as compared to an estimated slaughter of 32 million head in 1946. This goal is

designed to provide for a consumption of 155 pounds of meat per capita, substantially higher than the 126-pound average for prewar years 1935-39, and above the 140-145 pounds for 1946. Because of the need for greater pork output in both 1947 and 1948, the goals ask for a substantial increase in hog production. The 9.2 million sows for farrowing next spring are about 13 per cent more than the number farrowed in the spring of 1946. The goal proposes a reduced slaughter of sheep and lambs to check the downward trend in sheep numbers. Slowing down in the recent heavy rate of culling and the heavier feeding of dairy cows to increase output per cow are stressed in order to obtain the increased dairy goal. The desired egg production can be attained with normal culling from the present indicated number of hens and pullets.

Little change in the cost of production in 1947 is expected. Operating costs of most farmers are now nearly two-thirds more than they were a half dozen years ago. However, labor-saving machines, better crop rotations, improved crop varieties, better livestock, and other good farming practices have materially increased the output per man and have permitted farm families to operate larger farms, thereby increasing total output and reducing real costs per unit.

Since 1941 the ratio of prices farmers receive for their products to fertilizer costs has been very favorable and will likely continue to be in 1947. The wartime rise in prices of farm products in contrast to comparatively small increases in fertilizer prices has been the most important factor in creating this favorable ratio; also, the trend toward the use of higher-analysis fertilizers and the general price-control program have been of considerable assistance.

It is the opinion of the Bureau that if present trends toward wider use of fertilizer to support more stable systems of farming are continued or accelerated, demand for fertilizer in the future may be less dependent on export crops, primarily cotton and tobacco, than it has in the past. Systems of farming that include more feed crops and livestock in areas that have been users of fertilizer should not decrease total fertilizer consumption but rather should sustain high demand. Future demand for fertilizer will also be influenced by consumption in areas that have previously used relatively small quantities. Wartime consumption of plant nutrients in the older and heavier-using areas rose about 70 per cent over prewar levels. There is need for considerable capital investment in soil improvement, such as additions of phosphate and potash particularly to many of the soils in the humid areas, the Bureau states.

All told, the year 1947 promises to be a prosperous one for American agriculture. Let us hope that in a year-end retrospect we can so record it.

Resolutions

It has been said that—"Resolutions are things that go in one year and out the other." Be that as it may, the approach of income tax time always makes a great many of us wish that we had stuck more closely to our resolution to keep clear and complete records on transactions during the year under consideration. Farming is a complex business; therefore, the greater the need for farmers to keep accurate accounts of money taken in and money spent. Along with these should go inventories, records on crop yields, fertilizer applications, livestock programs, and the many other factors which make for good business management. Now is the time for farmers to review their past year's accounts and "resolve to do better."

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920.....	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921.....	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922.....	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923.....	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	40.8	149.0	192.0	109.0	141.0	16.40	52.70	....
1945									
December....	22.84	43.8	137.0	194.0	109.0	154.0	15.40	51.40	....
1946									
January.....	22.36	36.3	145.0	208.0	110.0	154.0	15.70	50.90	....
February.....	23.01	33.9	146.0	223.0	111.0	155.0	15.80	50.30	....
March.....	22.70	31.9	157.0	236.0	114.0	158.0	16.30	47.50	....
April.....	23.59	42.9	162.0	245.0	116.0	158.0	15.00	48.00	....
May.....	24.09	43.0	157.0	251.0	135.0	170.0	14.80	49.60	....
June.....	25.98	59.0	147.0	251.0	142.0	174.0	14.70	51.50	....
July.....	30.83	56.7	148.0	275.0	196.0	187.0	15.00	60.00	....
August.....	33.55	48.6	143.0	280.0	180.0	178.0	15.10	59.10	....
September...	35.30	48.8	128.0	224.0	173.0	179.0	15.40	57.80	....
October.....	37.69	53.0	122.0	209.0	171.0	188.0	16.10	66.00	....
November....	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
	Index Numbers (Aug. 1909—July 1914 = 100)								
1920.....	128	173	180	161	96	207	139	114	....
1921.....	137	195	163	129	81	117	98	129	....
1922.....	185	228	95	114	116	109	98	135	....
1923.....	231	190	133	137	129	105	110	183	....
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	408	214	219	170	160	138	234	212
1945									
December....	184	438	197	221	170	174	130	228	223
1946									
January.....	180	363	208	237	171	174	132	226	249
February....	186	339	209	254	173	175	133	223	275
March.....	183	319	225	269	178	179	137	211	283
April.....	190	429	232	279	181	179	126	213	282
May.....	194	430	225	286	210	192	125	220	177
June.....	210	590	211	286	221	197	124	228	185
July.....	249	567	212	313	305	212	126	266	163
August.....	287	486	205	319	280	201	127	262	162
September...	285	488	184	255	269	202	130	256	154
October.....	304	530	175	238	266	213	136	293	151
November....	236	438	176	228	198	214	145	399	207

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945						
December	1.75	1.42	7.81	5.77	4.86	6.71
1946						
January	1.75	1.42	7.81	5.77	4.86	6.71
February	1.75	1.42	7.81	5.77	4.86	6.71
March	1.75	1.42	7.81	5.77	4.86	6.71
April	1.75	1.42	7.81	5.77	4.86	6.71
May	1.75	1.42	9.08	6.10	4.86	7.30
June	1.88	1.42	10.34	6.42	4.86	7.90
July	1.88	1.42	11.62	8.15	5.34	9.60
August	2.22	1.46	16.88	8.14	6.07	12.14
September	2.22	1.46	10.32	6.95	6.07	12.14
October	2.22	1.46	13.20	7.12	8.30	12.14
November	2.22	1.46	15.19	11.26	12.14	12.75
Index Numbers (1910-14 = 100)						
1922	113	90	173	132	140	142
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945						
December	65	50	223	163	144	191
1946						
January	65	50	223	163	144	191
February	65	50	223	163	144	191
March	65	50	223	163	144	191
April	65	50	223	163	144	191
May	65	50	259	173	144	207
June	70	50	295	182	144	224
July	70	50	332	231	158	273
August	83	51	482	231	180	345
September	83	51	295	197	180	345
October	83	51	377	202	246	345
November	83	51	434	319	360	362

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1922	.566	3.12	6.90	.632	.904	23.87	....
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945							
December	.650	2.20	6.40	.535	.797	26.00	.200
1946							
January	.650	2.20	6.40	.535	.797	26.00	.200
February	.650	2.20	6.40	.535	.797	26.00	.200
March	.650	2.20	6.40	.535	.797	26.00	.200
April	.650	2.20	6.40	.535	.797	26.00	.200
May	.650	2.20	6.40	.535	.797	26.00	.200
June	.650	2.30	6.45	.471	.729	22.88	.176
July	.650	2.60	6.60	.471	.729	22.88	.176
August	.700	2.60	6.60	.471	.729	22.88	.176
September	.700	2.60	6.60	.471	.729	22.88	.176
October	.700	2.60	6.60	.471	.729	22.88	.176
November	.700	2.60	6.60	.535	.797	26.00	.200
Index Numbers (1910-14 = 100)							
1922	106	87	141	89	95	99	....
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945							
December	121	61	131	75	84	108	83
1946							
January	121	61	131	75	84	108	83
February	121	61	131	75	84	108	83
March	121	61	131	75	84	108	83
April	121	61	131	75	84	108	83
May	121	61	131	75	84	108	83
June	121	64	132	66	76	95	80
July	121	72	135	66	76	95	80
August	131	72	135	66	76	95	80
September	131	72	135	66	76	95	80
October	131	72	135	66	76	95	80
November	131	72	135	75	84	108	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1922.....	132	149	141	116	101	145	106	85
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	150	94	57	160	117	77
1944.....	195	176	151	96	57	174	120	76
1945								
December..	207	183	156	97	57	175	121	78
1946								
January...	206	184	156	97	57	175	121	78
February..	207	185	156	97	57	175	121	78
March....	209	187	158	97	57	175	121	78
April.....	212	188	160	97	57	175	121	78
May.....	211	192	162	99	57	189	121	76
June.....	218	196	163	100	60	203	121	70
July.....	244	209	181	103	60	230	121	70
August....	249	214	187	116	67	293	131	70
September.	243	210	181	108	67	223	131	70
October...	273	218	197	115	67	286	131	70
November.	263	224	198	128	67	382	131	78

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Since June 1941, manure salts are quoted F.O.B. mines exclusively.

** The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Annual Report, State Board of Agriculture, 1945-1946," Dover, Del., Vol. 36, No. 3, Sept. 30, 1946.

"State Laboratory Fertilizer, Feed and Seed Report, Jan.-June 1946," State Board of Agr., Dover, Del., Vol. 36, No. 2, June 30, 1946.

"Effect of Fertilizer and Environment on the Calcium, Phosphorus, and Iron Content of Cowpeas," Agr. Exp. Sta., Experiment, Ga., So. Coop. Series Bul. 4, Nov. 1946.

"The Indiana Fertilizer Law and How to Comply With It," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Cir. 314, Jan. 1946, F. W. Quackenbush and O. W. Ford.

"Commercial Fertilizers in Kentucky in 1945," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Reg. Bul. 49, July 1946, J. D. Turner, H. R. Allen, and Lelah Gault.

"Analyses of Official Fertilizer Samples," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Reg. Bul. 53, Sept. 1946.

"Commercial Feeds, Fertilizers and Agricultural Liming Materials," State Insp. and Reg. Serv., Univ. of Md., College Park, Md., No. 199 Control Series, Aug. 1946.

"Progress Report on the Use of Boron in Walnut and Filbert Orchards," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Cir. of Inf. 363, May 1945, C. E. Schuster and R. E. Stephenson.

"Fertilizer Report," State Dept. of Agr., Harrisburg, Pa., Vol. 28, No. 3, May-June 1945.

"Fertilizer Report," State Dept. of Agr., Harrisburg, Pa., Vol. 29, No. 3, May-June 1946.

"Inspection and Analysis of Commercial Fertilizers," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 366, Nov. 1946, B. D. Cloaninger.

"Farm Manure," Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 288, June 1946, H. A. Woodle and W. H. Craven.

Soils

"Summary of Results on the Physical and Chemical Condition of Ohio Greenhouse Soils," Agr. Exp. Sta., Wooster, Ohio, Agron. Mimeo. 101, Feb. 5, 1946, J. B. Page.

"The Salt Problem in Irrigation Agriculture," U.S.D.A., Washington, D. C., Misc. Publ. 607, Aug. 1946.

"Effect of Chloride and Sulfate Salts on the Growth and Development of the Elberta Peach on Shalil and Lovell Rootstocks," U.S.D.A., Washington, D. C., T. Bul. 922, Sept. 1946, H. E. Hayward, E. M. Long, and Rachel Uhvits.

"Strip Cropping for Conservation and Production," U.S.D.A., Washington, D. C., F. Bul. 1981, Sept. 1946, H. E. Tower and H. H. Gardner.

"Soil Survey—Sullivan County New York," U.S.D.A., Washington, D. C., Series 1938, No. 8, Sept. 1946, Wilber Secor, D. F. Kinsman, W. E. Benson, C. B. Lawrence, Willard DeGolyer, and Clarence Lounsbury.

"Soil Survey—Union County Pennsylvania," U.S.D.A., Washington, D. C., Series 1940, No. 2, Sept. 1946, S. R. Bacon, David Taylor, Alfred Boileau, and Gerald Yoder.

"Physical Land Conditions in the Farm Security Soil Conservation District Harmon County, Okla.," U.S.D.A., Washington, D. C., Phys. Land Survey No. 40, 1946, Ralph H. Bond.

"More From Your Farm," U.S.D.A., Washington, D. C., P.A. 20, Oct. 1946.

Crops

Interesting information on the composition of numerous grasses and legume crops is given in Virginia Agricultural Experiment Station Technical Bulletin 102 entitled "Mineral Constituents and Protein Content of Certain Grasses and Legumes Grown in Pure Stands on Three Soil Types" by N. O. Price, W. N. Linkous, and H. H. Hill. The investigations were carried out over a period of years on three soil types, representing the limestone valley area, the Piedmont area, and the coastal plain. Among the leguminous crops grown were ladino clover, white Dutch clover, common lespedeza, Korean lespedeza, Kent wild white clover, Louisiana white clover, black medic hop clover, Dixie white clover, Altasweed clover, yellow trefoil, spotted bur clover, subterranean

clover, Persian clover, and strawberry clover, while among the grasses were Kentucky bluegrass, orchard grass, timothy, perennial ryegrass, Chewings fescue, sheep fescue, red-top, Italian ryegrass, brome grass, tall fescue, tall oat grass, Canada bluegrass, Rhodes grass, rough stalk meadow grass, western wheatgrass, Bermuda grass, meadow foxtail, bulbous bluegrass, Reeds canary grass, crabgrass, Hardings grass, and several different strains of other grasses. Not all of these grasses are reported at each location. The legumes usually were higher in proteins than the grasses, although there were exceptions. The phosphorus content was not nearly so variable, the grasses in general holding their own with the legumes. Calcium tends to be distinctly higher in the legumes. The magnesium tends to be higher in the legumes, while there was considerable variation in the potash, the grasses carrying in general about as much as the legumes. There was considerable variation in composition due to the soil on which the plants were grown. Data on nitrogen:calcium, calcium:phosphorus, and nitrogen: phosphorus ratios are given, as well as experience ratings in getting stands of the various grasses and legumes.

Growers of flue-cured tobacco in South Carolina and neighboring states will find Clemson Agricultural College Extension Circular 287, "Tobacco Production" by H. A. McGee and J. M. Lewis, a source of much useful and practical information. The authors bring out that while tobacco is grown on a wide variety of soils, there must be certain characteristics, especially with reference to drainage and organic matter, if tobacco is to be successfully grown. These can be modified to some extent, but the nearer they come to the desired characteristics, the more successful the tobacco growing is likely to be. Rotations are important although usually are not as systematically carried out as might be desirable. Legumes are usually not desirable crops to precede tobacco, Austrian winter peas being especially undesirable. Non-leguminous winter cover crops such as small grains give good results, while letting the ground grow up to weeds preceding the tobacco usually gives excellent results. Several rotations that fit in well with tobacco and at the same time furnish a comparatively well-balanced farming system are suggested. The authors take up the individual elements in the nutrition of tobacco. There probably is no crop grown which requires greater care in its fertilization than does the tobacco crop, if high quality and good yield are to be obtained. Nitrogen and potash are particularly important. Nitrogen must be available in amounts up to 20 to 40 lbs. per acre, but an excessive quantity can play havoc with the crop. Experimental evidence indicates that it is desirable to have at least half of the nitrogen in an organic form in order to spread the supply throughout the season. Potash is important in determining growth and quality of the crop and since most tobacco soils are deficient in this nutrient, rather large quantities are needed in the fertilization of this crop. It is stated that 60 to 90 lbs. K_2O per acre usually are used, with 100 to 150 lbs. desirable. Phosphorus usually is necessary in quantities of 60 to 80 lbs. of phosphoric acid per acre. The fertilizer should be such that some chlorine will be furnished, but excessive quantities of this element are to be avoided. It is suggested that the fertilizer contain 2 to 3% of this element. Sulphur also is needed. With the common materials now going into fertilizer, it is usually a problem to hold the sulphur within a certain limit. It is suggested that the fertilizer contain at least 3% but not more than 5% sulphur. Magnesium is another element important in the nutrition of tobacco, the lack of it giving rise to a condition known as sand drown, and it is suggested that the fertilizer contain 2% magnesium oxide. Calcium is needed for the plant, but an excess is to be avoided, with the maximum of 5% calcium oxide in the tobacco fertilizer suggested. In general the crop desires an acid soil. Among

the secondary and minor elements are boron, copper, iron, manganese, and zinc, which at one time or another have been shown to be needed on tobacco. The limits between optimum amounts and toxic amounts are rather narrow, so these materials must be used with care and in accordance with the specific needs of the fields on which the crop is being grown. As a general recommendation, the authors state that a fertilizer for flue-cured tobacco should contain 3% nitrogen, 8% phosphoric acid, 6 to 9% potash, 2% magnesium, 5% calcium oxide, 2% chlorine, and 3% but not more than 5% sulphur, at the rate of 800 to 1,200 lbs. per acre. Information on variety, soil preparation, transplanting, cultivation, management during the growing season, marketing, and the early history of tobacco completes the publication.

"Home Gardening," Agr. Ext. Serv., Univ. of Ariz., Tucson, Ariz., Ext. Cir. 130, May 1946, Harvey F. Tate.

"Peach and Nectarine Growing in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 98, March 1946 (Rev. April 1946), G. L. Philp and L. D. Davis.

"Fruit Varieties," Dept. of Agr., Toronto, Ont., Can., Bul. 430, Rev. April 1946, E. F. Palmer.

"Orchard Grafting," Dept. of Agr., Toronto, Ont., Can., Bul. 439, April 1944, W. H. Upshall.

"Grass and Legume Silages for Dairy Cattle," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 605, June 1946, W. B. Nevens, K. E. Harshbarger, and K. A. Kendall.

"Louisiana Shallots," Div. of Agr. Ext., La. State Univ., Baton Rouge, La., Ext. Cir. 260, May 1946, G. L. Tiebout and Joseph Montelaro.

"Potatoes," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Reprint from Bul. 442, June 1946.

"Improving Pastures in Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 419, June 1945.

"Tests of Corn Hybrids and Varieties in Mississippi, 1945," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 427, Jan. 1946, R. C. Eckhardt, W. A. Douglas, and A. L. Hamner.

"Breeding and Improvement of Peach Varieties in New Jersey," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 726, June 1946, M. A. Blake and L. J. Edgerton.

"Growing Winter Barley in New Jersey," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 727, June 1946, R. S. Snell, C. S. Garrison and G. H. Ahlgren.

"Growing Tomatoes in New Jersey Home Gardens," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 481, May 1944.

"Fifty-eighth Annual Report, 1945," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y.

"Palatability for Sheep and Yield of Hay and Pasture Grasses at Union, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 431, Oct. 1945, D. E. Richards and V. B. Hawk.

"Growing Subclover in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 432, Oct. 1945, H. H. Rampton.

"Field Corn Production in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 434, Oct. 1945, R. E. Fore.

"Diseases of the Walnut in the Pacific Northwest and Their Control," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 435, Nov. 1945, P. W. Miller, C. E. Schuster, and R. E. Stephenson.

"Grain Sorghums for South Carolina," Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 285, June 1946, H. A. Woodle and W. H. Craven.

"Varieties of Fruit for South Dakota," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 61, Feb. 1946, S. A. McCrory.

"Little Bluestem Meadows in East Texas," Agr. Exp. Sta., Texas A & M, College Station, Tex., P.R. 1020, July 9, 1946, J. B. Pope.

"Broccoli Variety Trials at College Station," Agr. Exp. Sta., Texas A & M, College Station, Tex., P.R. 1023, July 30, 1946, W. H. Brittingham.

"Relation of Temperature and Seed Moisture to the Viability of Stored Soybean Seed," U.S.D.A., Washington, D. C., Cir. 753, Sept. 1946, E. H. Toole and Vivian K. Toole.

"Ladino White Clover for the Northeastern States," U.S.D.A., Washington, D. C., F. Bul. 1910, 1946, E. A. Hollowell.

"Onion-Set Production," U.S.D.A., Washington, D. C., F. Bul. 1955, Rev. Oct. 1946, J. C. Walker, W. C. Edmundson, and H. A. Jones

"Crotalaria—Culture and Utilization," U.S.D.A., Washington, D. C., F. Bul. 1980, Oct. 1946, Roland McKee, G. E. Ritchey, J. L. Stephens, and H. W. Johnson.

"Variability of Certain Seed, Seedling, and Young-Plant Characters of Guayule," U.S.D.A., Washington, D. C., T. Bul. 919, Aug. 1946, W. T. Federer.

Economics

"Cotton Marketing Organization, Facilities, and Practices of 36 Cotton Improvement Groups in Georgia, 1940," Ga. Agr. Exp. Sta., Experiment, Ga., Bul. 249, Aug. 1946, N. M. Penny.

"Peach and Cherry Costs in Michigan,"

Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Cir. Bul. 201, June 1946, K. T. Wright and Stanley Johnston.

"Apple and Pear Costs in Michigan," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Cir. Bul. 202, June 1946, K. T. Wright and Walter Toenjes.

"Small Fruit Costs in Michigan," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Cir. Bul. 203, June 1946, K. T. Wright and Stanley Johnston.

"Part-Time Farming in Michigan," Ext. Serv., Mich. State College, East Lansing, Mich., Ext. Bul. E-278, June 1946, E. B. Hill and L. H. Brown.

"Michigan Farm Organization and Practices," Agr. Exp. Sta., Mich. State College, Sp. Bul. 337, June 1946, Lauren H. Brown.

"Farm Organization and Adjustment Problems in the Shortleaf Pine Area of Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 405, June 1944, E. A. Tucker, F. J. Welch, and J. C. Downing.

"Intensity of Land Use in Pennsylvania," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper No. 1322, April 1946, P. I. Wrigley.

"The Economic Outlook in Sumter, South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 365, May 1946, J. M. Stepp and S. F. Phillips, Jr.

"Farming Systems and Practices, Red Soil Area, Eastern Highland Rim, Tennessee, 1944," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Mon. 200, June 7, 1946, S. W. Atkins and C. C. Mantle.

"Income and Expenses in Growing and Marketing Irish Potatoes Cumberland Plateau, 1943-1944," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn. Mon. 204, July 8, 1946, F. N. Masters and C. C. Mantle.

"Annual Report on Tobacco Statistics, 1946," U.S.D.A., Washington, D. C., CS-20, Sept. 1946.

"Programs of Foreign Governments for Fiber-Flax Production," U.S.D.A., Washington, D. C., Foreign Agr. Rep. 10, Aug., 1946, Cecille M. Protzman.

Slow Fires in the Soil

By G. D. Scarseth

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ORGANIC MATTER is the firewood in the soil. Too often we smother this fire and then we are in for trouble. Let's have lots of fuel in the soil, but if it is to do the most good it must burn brightly when we need it.

On a cold winter evening it is comfortable to hear the old living-room heater roar as the wood is changed to gasses that burn. The destruction of the organic matter of the wood goes on at such a fast rate that the heat released becomes intense.

A hard run for a stray calf makes the sweat pour because the body must "burn up" some food fast enough to supply the necessary power. For a noon nap, some covers feel comfortable because, thus relaxed, not enough energy is used to keep the resting body warm, although the room is at a desirable temperature when moving about.

A snake or alligator moves so seldom that it can get along on a meal only every few weeks or months and need not burn enough fuel for energy to even warm its body.

When silage or sauerkraut is started the bacteria and yeasts find the sugars in the mass of material such an abundant supply of food, that they multiply so rapidly the chemical reactions of this first stage of decomposition give off more heat than is conducted away, with the result that the silage or kraut becomes warm. Wet hay may decompose so fast, because of microbial action, that the heat of decomposition may accumulate sufficiently to ignite the hay.

Therefore, we see that whenever an organic substance, like wood, coal, straw, manures, or any vegetable matter decomposes, heat is given off. The amount of heat given off is actually the same if the total destruction is rapid as from burning by fire or slow as from microbial decomposition. The heat effect in decomposition is ordinarily not noticed because the heat produced is usually conducted away too fast to be observed.

Keep the Drafts Open

Everybody knows that a soil rich in organic matter is likely to be highly productive if that organic matter is rotting fast. If it is rotting fast it is releasing available nitrogen and phosphorus and other nutrients for plant roots to use. But if organic matter is to decompose rapidly, the air (oxygen) supply must be abundant. In other words, if the organic matter is to "burn" fast, the drafts and all check dampers, as in the stove, must be wide open—the soil must be porous and warm.

The comparison of decomposition of organic matter to a burning fire goes even further. If the fire in the stove is suddenly smothered, the burning of the carbonaceous wood or coal would not be able to convert the carbon to carbon dioxide, as in a well-aired fire. Some of the gasses produced would be the poisonous carbon monoxide. Likewise, in a soil well supplied with organic matter (fuel for micro-organisms) if the air supply is poor because of waterlogging or lack of porosity because of poor tilth, a wrong kind of decomposition (burning) takes place. Certain bacteria called anaerobes will rob oxygen from oxides in the soil, as from iron oxides or oxides of sulfur (sulfates), and convert these to poisons, as hydrogen sulfide (the smell of rotten eggs or a frozen cabbage field thawing), or to ferrous iron—the bluish color of poorly drained subsoils. Besides producing these poisonous products the carbon dioxide produced by this smothered rotting or slow burning fills the air spaces and further crowds out the oxygen.

This comparison illustrates how important it is that organic matter must be in an active process of decaying with lots of air entering the soil to feed these slow fires and to ventilate out the bad air. The ideal condition is like that Nature builds in unpastured woodland soils. Here the porosity is at a maximum and new fuel, fresh organic matter, is decomposing every warm day when the soil is moist.

Organic Matter as a Fuel for Warming the Soil

We have been thinking of organic matter as beneficial primarily for improving the soil tilth, supplying available nitrogen, and adding to the moisture-holding capacity of the soil; but the heat effect of decomposing organic matter has usually gone unnoticed. From the foregoing we know that when decomposing organic matter, such as cornstalks, is plowed under it is safe to estimate that another ton of roots is involved. Three tons of tops and roots per acre would give off as much heat in total decomposition as the burning of about 1.5 tons of hard coal. This amount of heat is not to be ignored—it has real value to the farmer. But in order for it to be of value, the organic matter must be decomposing actively—the slow fires of the soil must actually burn and more fuel must be added from time to time as with legumes or manures plowed under.

Good Pastures Conserve And Pay

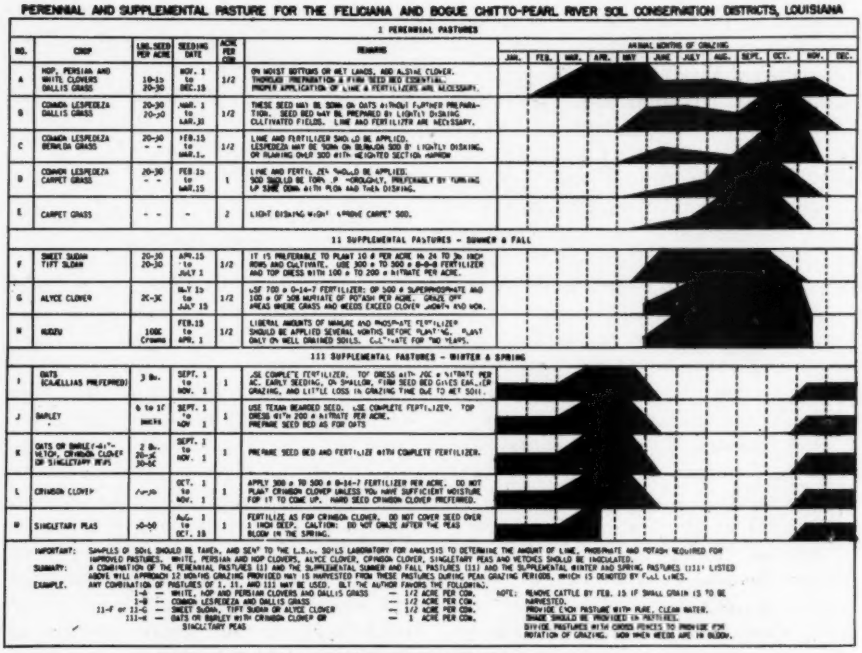
(*From page* 18)

mal units, correct seasonal use, mowing and the re-application of phosphorus, potash, and lime as needed. Both Seal and Jones have been doing considerable management work since they started improving their pasture.

Very few permanent pastures are capable of providing the year-round grazing which Seal gets. Usually it is essential that supplemental pasture and feed be provided.

Many soil conservation districts, with

the aid of the Soil Conservation Service technicians, have prepared pasture calendars or charts to be used as guides by the district cooperators in establishing and managing pastures properly. Typical of these pasture calendars is the accompanying one which was prepared by W. E. Dee, District Conservationist, Kentwood, Louisiana, for use in a district in southeast Louisiana.


PERENNIAL AND SUPPLEMENTAL PASTURE FOR THE FELICIANA AND BOGUE CHITTO-PEARL RIVER SOIL CONSERVATION DISTRICTS, LOUISIANA

I PERENNIAL PASTURES

NO.	CROP	LBS. SEED PER ACRE	SEEDING DATE	ACRE PER COW	REMARKS	ANIMAL MONTHS OF GRAZING: JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
A	HOP, PERSIAN AND WHITE CLOVERS DALLIS GRASS	10-15 20-30	NOV. 1 to DEC. 15	1/2	ON MOIST BOTTOMS OR WET LANDS, ADD ALSIKE CLOVER. THOROUGH PREPARATION & FIRM SEED BED ESSENTIAL. PROPER APPLICATION OF LIME & FERTILIZERS ARE NECESSARY.	
B	COMMON LESPEDEZA DALLIS GRASS	20-30 20-30	MAR. 1 to MAR. 31	1/2	THESE SEED MAY BE SOWN ON OATS WITHOUT FURTHER PREPARATION. SEED BED MAY BE PREPARED BY LIGHTLY DISKING CULTIVATED FIELDS. LIME AND FERTILIZER ARE NECESSARY.	
C	COMMON LESPEDEZA BERMUDA GRASS	20-30 " "	FEB. 15 to MAR. 1	1/2	LIME AND FERTILIZER SHOULD BE APPLIED. LESPEDEZA MAY BE SOWN ON BERMUDA SOD BY LIGHTLY DISKING, OR PLANING ONLY SOD WITH WEEDING SECTION HARROW	
D	COMMON LESPEDEZA CARPET GRASS	20-30 " "	FEB 15 to MAR. 15	1	LIME AND FERTILIZER SHOULD BE APPLIED. SOD SHOULD BE TORN UP THOROUGHLY, PREFERABLY BY TURNING UP SOME CORN WITH PLOW AND THEN DISKING.	
E	CARPET GRASS	" "	"	2	LIGHT DISKING WHICH PROVE CARPET SOD.	

II SUPPLEMENTAL PASTURES - SUMMER & FALL

F	SWEET SUDAN TIFT SUDAN	20-30 20-30	APR. 15 to JULY 1	1/2	IT IS PREFERABLE TO PLANT 10 # PER ACRE IN 24 TO 36 INCH ROWS AND CULTIVATE. USE 300 # TO 500 # 0-8-8 FERTILIZER AND TOP DRESS WITH 100 # TO 200 # NITRATE PER ACRE.	
G	ALYCE CLOVER	20-30	MAY 15 to JULY 15	1/2	USE 700 # 0-14-7 FERTILIZER OR 500 # SUPERPHOSPHATE AND 100 # OF 50% MURIATE OF POTASH PER ACRE. GRAZE OFF AREAS WHERE GRASS AND WEEDS EXCEED CLOVER GROWTH AND VOL.	
H	KUDZU	100 Crowns	FEB. 15 to APR. 1	1/2	LIBERAL AMOUNTS OF MANURE AND PHOSPHATE FERTILIZER SHOULD BE APPLIED SEVERAL MONTHS BEFORE PLANTING. PLANT ONLY ON WELL DRAINED SOILS. CULTIVATE FOR TWO YEARS.	

III SUPPLEMENTAL PASTURES - WINTER & SPRING

I	OATS (CAMELLIAS PREFERRED)	3 Bu.	SEPT. 1 to NOV. 1	1	USE COMPLETE FERTILIZER. TOP DRESS with 200 # NITRATE PER AC. EARLY SEEDING, ON SHALLOW, FIRM SEED BED GIVES EARLIER GRAZING, AND LITTLE LOSS IN GRAZING TIME DUE TO WET SOIL.	
J	BARLEY	6 to 12 bu/ac	SEPT. 1 to NOV 1	1	USE TEXAS BEARDED SEED. USE COMPLETE FERTILIZER. TOP DRESS with 200 # NITRATE PER ACRE. PREPARE SEED BED AS FOR OATS	
K	OATS OR BARLEY WITH CRIMSON CLOVER OR SINGLETARY PEAS	2 Bu. 20-25 30-50	SEPT. 1 to NOV. 1	1	PREPARE SEED BED AND FERTILIZE with COMPLETE FERTILIZER.	
L	CRIMSON CLOVER	15-20	OCT. 1 to NOV. 1	1	APPLY 300 # TO 500 # 0-14-7 FERTILIZER PER ACRE. DO NOT PLANT CRIMSON CLOVER UNLESS YOU HAVE SUFFICIENT MOISTURE FOR IT TO COME UP. HARD SEED CRIMSON CLOVER PREFERRED.	
M	SINGLETARY PEAS	40-50	AUG. 1 to OCT. 15	1	FERTILIZE AS FOR CRIMSON CLOVER. DO NOT COVER SEED OVER 1 INCH DEEP. CAUTION: DO NOT GRAZE AFTER THE PEAS BLOOM IN THE SPRING.	

IMPORTANT: SAMPLES OF SOIL SHOULD BE TAKEN AND SENT TO THE L.S.U. SOILS LABORATORY FOR ANALYSIS TO DETERMINE THE AMOUNT OF LIME, PHOSPHATE AND POTASH REQUIRED FOR IMPROVED PASTURES. WHITE, PERSIAN AND HOP CLOVERS, ALYCE CLOVER, CRIMSON CLOVER, SINGLETARY PEAS AND VETCHES SHOULD BE INOCULATED.

SUMMARY: A COMBINATION OF THE PERENNIAL PASTURES (I) AND THE SUPPLEMENTAL SUMMER AND FALL PASTURES (II) AND THE SUPPLEMENTAL WINTER AND SPRING PASTURES (III) LISTED ABOVE WILL APPROACH 12 MONTHS GRAZING PROVIDED MAY IS REPRESENTED FROM THESE PASTURES DURING PEAK GRAZING PERIODS, WHICH IS DENOTED BY FULL LINES.

EXAMPLE. ANY COMBINATION OF PASTURES OF I, II, AND III MAY BE USED. BUT THE AUTHOR FAVORS THE FOLLOWING.

I-A	— WHITE, HOP AND PERSIAN CLOVERS AND DALLIS GRASS	— 1/2 ACRE PER COW.
I-B	— COMMON LESPEDEZA AND DALLIS GRASS	— 1/2 ACRE PER COW.
II-F or II-G	— SWEET SUDAN, TIFT SUDAN OR ALYCE CLOVER	— 1/2 ACRE PER COW.
III-K	— OATS OR BARLEY WITH CRIMSON CLOVER OR SINGLETARY PEAS	— 1 ACRE PER COW.

NOTE: REMOVE CATTLE BY FEB. 15 IF SMALL GRAIN IS TO BE HARVESTED.
PROVIDE EACH PASTURE WITH PURE, CLEAN WATER.
SHADE SHOULD BE PROVIDED IN PASTURES.
DIVIDE PASTURES WITH CROSS FENCES TO PROVIDE FOR ROTATION OF GRAZING. MOW WHEN WEEDS ARE IN BLOOM.

Prepared by: W. E. Dee, District Conservationist, Soil Conservation Service, Kentwood, Louisiana

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A pasture calendar prepared for use in the Feliciana and Bogue Chitto-Pearl River Soil Conservation District, Louisiana.

The Use of Dipicrylamine in Tissue Testing for Potash

(*From page* 26)

2=moderate orange flecks=Medium potassium.

3=almost solid orange=High potassium.

Application of the Test and Comparison with Cobaltinitrite

In order to establish the desirability of the dipicrylamine test for potassium, tissue tests were made on corn from the Jordan Soil Fertility Plots (7) by both methods and compared with the treatments applied to the soil and any observable deficiency symptoms.

The filter paper samples were obtained by expressing the sap from the midribs of corn leaves. The samples represented about 2½ inches of midrib at the base of the leaf immediately below the main ear. Eight plants from each plot were sampled and the eight midrib portions were combined into one sample, rolled in filter paper, and the sap expressed with pliers. The midribs were discarded and the sat-

urated filter paper was folded in a paper towel, dried, and tested at a later date. (The filter paper procedure has been found to be particularly useful when large numbers of plots are to be sampled in a relatively short time since the dried samples can be stored and tested at any convenient later date.)

Included in the 36 plots of each tier of Jordan Soil Fertility plots are 10 plots receiving no commercial potassium, fertilizer, or manure, 4 plots receiving manure in different amounts, and 20 plots receiving potash at the rate of 100 pounds of K_2O per acre. These treatments are applied with different amounts and carriers of nitrogen and phosphorus and have been continuous for over 60 years. These categories were selected for simplicity in the following comparison.

The results for the cobaltinitrite method were obtained under controlled conditions in the laboratory using a Klett-Summerson colorimeter for the estimation of turbidity. The readings shown are simply the scale readings of the colorimeter. The evaluation of the dipicrylamine test was on the basis previously mentioned.

	Cobaltinitrite method	Dipicrylamine method
Average of 10 plots receiving no potash or manure	55	0.6
Average of 4 manure-treated plots	166	2.9
Average of 20 potash-treated plots	166	2.6

The decimals shown under the dipicrylamine method are the result of averaging the readings for the number of plots shown in each group respectively. Reading for any one determination is on the basis of whole numbers 0, 1, 2, and 3, or when undecided whether a reading is for example a 2 or 3, it can be recorded as 2.5. Accuracy beyond general classes such as high, low, and medium is usually unwarranted.

The results indicate that both methods reflect the amount of potassium in the plant sap satisfactorily, and that these readings correspond to observable potash-deficiency symptoms. Pronounced marginal scorch of the lower corn leaves occurred on many of the potash-deficient plots. However, since the dipicrylamine procedure yielded results as satisfactory as the cobaltinitrite procedure, and eliminated the difficulties sometimes encountered with cobaltinitrite, it appears to be a more desirable tissue test for potassium using the filter paper technique.

Furthermore, preliminary trials in the field indicate that with a crop like corn the test can be performed directly on the split stalk or a diagonal cut of the stalk (analagous to the diphenylamine test for nitrates on the split stalk). The white background of corn pith and its absorbing ability serve in the same fashion as the filter paper. One drop of reagent No. 1 is smeared on the split stalk and then 1 or 2 drops of reagent No. 2 are smeared over the same area. If potassium is present, the orange red fleck precipitate is readily observable on the corn pith. The desirability of the test on the stalk itself will only be properly evaluated with further use of the test and experience gained in interpretation of the readings.

References

(1) Hoffer, G. N. *Fertilizing Golf Greens.* Better Crops with Plant Food. Vol. 29, No. 4, (Apr. 1945).

(2) Thornton, S. F., Connor, S. D., and Fraser, R. R. *The Use of Rapid Chemical Tests on Soils and Plants as Aids in Determining Fertilizer Needs.* Purdue Univ. Agr. Expt. Sta. Cir. 204 (1939).

(3) Peech, M. and English, L., *Rapid Microchemical Soil Tests.* Soil Science 57: 167-195, (1944).

(4) Poluektoff, N. S. *Mikrochemie,* 1933-1934, 14, 265.

(5) Fiegl, F. *"Spot Tests".* Nordeman

Publishing Co., Inc., New York, N. Y. (1939).
(6) *B. D. H. Reagents for Spot Tests,* The British Drug Houses, Ltd., London N-1 (1936).
(7) Noll, C. F., Gardner, F. D., and Irvin, C. J. *Fiftieth Anniversary of the General Fertilizer Tests,* Penna. Agr. Expt. Sta. Bul. 264 (1931).

Farm Security Administration Gave Me My Start

(*From page* 25)

lead to my being a successful farmer.

Needless to say all these things were essential and I could not leave any of them out and be successful. As I proceeded to establish these recommended practices, I found they work hand in hand, each depending on the other; *i.e.,* my pasture, four acres, had previously been sown but not treated. I immediately limed and used a balanced fertilizer, with an additional 100 pounds potash and 300 pounds phosphate per acre. This increased the grazing from not enough for one cow to more than enough for two cows. In the last four years I have used 50 tons of dolomitic limestone, with about four tons of a complete fertilizer yearly. In addition to this I use a liberal application of nitrogen top-dressing on corn and small grain. On tobacco, I top-dress with 100 pounds of 5-5-20 per acre. This liberal use of fertilizer along with my four-year rotation has increased my yields as follows:

Corn from 15 to 40 bushels per acre
Tobacco from 860 to 1,150 pounds per acre
Barley from 20 to 46 bushels per acre
Lespedeza from 5 to 6 inches to 12 inches in height and ½ ton per acre increase in hay.

Does this increase in yield per acre mean more money? Yes.

Does it mean more work? Yes, only at harvest time.

Does it mean more work per unit of feed or pounds of tobacco? No, actually less work.

Is labor cheaper than fertilizer? My answer is definitely no, although labor is more scarce.

After four years' farming by methods described, I am firmly convinced that it is not only cheaper, and more productive, but is the most satisfactory method of farming. I plan to keep right on with conservation farming.

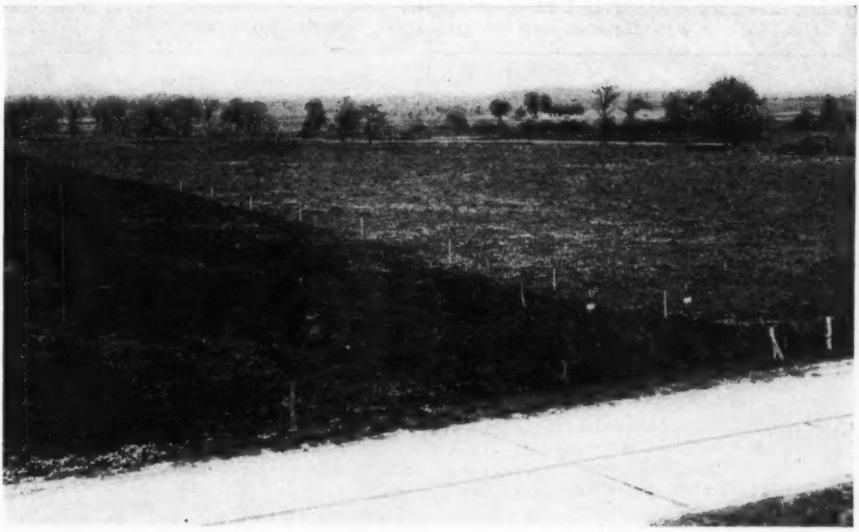
In conclusion let me say that of more than $5,000 I borrowed from Uncle Sam through Farm Security Administration in 1941, I now owe only $2,000. The value of my farm and buildings has increased on a normal market at least $2,000. Farm Security Administration has been to me a big brother; Soil Conservation Service, a grand friend; and Uncle Sam, a father.

Thirty Years of Building-up Soils in Wisconsin

(*From page* 10)

the kind and amount of fertilizer he can use to best advantage."

For many years Chapman has been recommending the following fertility program to Wisconsin dairy farmers: "Lime every acre of acid soil on the farm and apply from 200 to 300 pounds per acre of a phosphate or phosphate-potash fertilizer such as 0-20-0, 0-20-10, or 0-20-20 at the time of seeding down. For corn in the rotation, apply 100 to 150 pounds per acre of 3-18-9 or 3-12-12 fertilizer in the hill or row as a supplement to stable manure. Where animal manure is not adequate, an additional treatment with a high-grade complete



Note the striking difference between the fertilized and unfertilized portions of one of Chapman's permanent pasture demonstrations. The half on the left received 175 lbs. of ammonium nitrate per acre, and it yielded an added net profit of $20 per acre.

fertilizer is necessary. In my judgment, this is a well-rounded soil fertility program."

As to what the future holds for progress in soil fertility, Chapman contends that prediction is difficult.

"Our rates of application at present are too small. We could easily double with profit the amount of plant food now used on grain and legume seedings. The use of fertilizers on pastures and meadows is just getting underway. We know that more nitrogen can be used on our corn, sugar beets, cabbage, tobacco, hemp, and other special nonlegume crops. Even this is but a beginning. Our farmers in Wisconsin have just awakened to the need for and the profit in using commercial plant food.

"One thing I am quite sure of," adds Clint Chapman, "Wisconsin crops are still hungry for plant food."

Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop

(*From page* 23)

perhaps would give different results.

1945-46 results. Large pilot tests were established in the fall of 1945 to determine the practicality of cover crop fertilization. Mixed fertilizer (4-12-8) at the rate of 1,500 lbs. per acre was applied by G.L.F. equipment to portions of four fields of rye and one of rye grass on October 11. Other portions of the same field were treated with 750 lbs. of fertilizer at this date and another 750 lbs. in the late winter (week of February 27). A third portion was treated with 1,500 lbs. of 4-12-8 during the same week in February. The remainder of the field was fertilized just prior to planting the peas and in case of corn on April 5. Peas were grown on four of the fields while the fifth, because of its very sandy nature, was planted to sweet corn.* Altogether about 100 acres and 75 tons

* Too sandy to use mechanical pea harvesters.

TABLE 2.—THE RELATIVE YIELDS OF COVER CROPS TOP-DRESSED[1] WITH VARIOUS FERTILIZERS AND OF THE PEAS WHICH FOLLOWED

Treatment	Yield		
	Cover Crop [2]		Peas [3]
	Rye	Rye Grass	
Check (no fertilizer)	100	100	100
N applied in fall to cover	165	122	105
N applied in winter to cover	139	109	108
N applied before planting	.....	.....	103
2N applied ½ in fall, ½ in winter	204	134	104
2N applied before planting	.....	.....	102
P applied in fall to cover	104	98	110
P applied before planting	.....	.....	108
K applied in fall to cover	106	100	108
K applied before planting	.....	.....	106
NPK applied in fall to cover	173	118	113
NPK applied before planting	.....	.....	114

[1] N = Ammonium nitrate; P = triple super, 47% P_2O_5; K = muriate of potash, 61% K_2O } at rate of 200 lbs. per acre.
[2] Based on 18 samples for rye and 15 samples for rye grass.
[3] Based on 11 tests, duplicate pots in each or a total of 22 pots for each treatment.

of fertilizer were used in this test. Relative yields are given in Table 3.

The results of Table 3 indicate that for producing peas, cover crop fertilization was at least as good as regular methods of fertilization and perhaps slightly better. It also produced a better cover crop. However, increases in yields of cover crops were relatively small evidently due to the early plowing dates. This also may be the reason for the very poor showing of the late winter fertilization.

For corn grown on Sassafras sand, early fertilization on cover crop was as good as late fertilization. Split applications were slightly better although the difference is not significant. Unfortunately, a much larger amount of fertilizer was applied by conventional

TABLE 3.—RELATIVE YIELDS OF COVER CROP AND THE PEAS AND SWEET CORN WHICH FOLLOWED AS INFLUENCED BY FERTILIZATION OF THE COVER CROP

Treatment	Cover Crop [2]	Peas [3]		Ears of Sweet Corn [4]	
		Vines	Seeds	No	Wt.
Check [1]	100	100	100	.....	.....
All applied Oct. 11, 1945	128	113	106	100	100
½ in Oct.; ½ in week of Feb. 27	128	113	112	100	108
All applied during week of Feb. 27	104	108	112	100	100

[1] 1,500 #4-12-8 per acre applied just before plowing cover crop.
[2] Based on dry wt. of 9 samples, each 1 sq. ft. in area.
[3] Based on fresh wt. of 20 samples, each 1 sq. yard in area.
[4] Based on 5 fifty-ft. strips for each treatment. Wt. = fresh wt. of corn on the cob.

Fig. 6. Placing soil and cover crop in pots to note effect of cover crop fertilization on succeeding crop. Rye grass in foreground treated with 200 lbs. ammonium nitrate per acre, check in background.

fertilizer spreaders to the remainder of the field set aside as a check, so that no comparative data with regular fertilization is available. However, yields of the corn fertilized at different times would indicate no serious loss of nutrients. Because of the very sandy nature of this soil this is an extremely interesting fact.

Discussion

It would appear from the foregoing that fertilization of non-leguminous cover crops has definite possibilities. Much research, however, remains to be done on the following subjects:

Time of application. The yields of cover crop were greatest when fertilizer was applied in the fall. The fertilizer in all cases has been applied while the ground was still open and plants actively growing. It is not known how late in the season such fertilizer may be applied and still have a large portion of the soluble nutrients retained. There is some indication that a split application of fertilizer would be more useful. Also not known is the best age of cover crop for applying fertilizer and also whether such fertilizer can be applied before cover crop is up. Work is now being started to check on all these points.

Time of plowing cover crop. The time of plowing under the cover crop has an important bearing on the response to late winter applications. It may also have some significance in the release of nutrients for the succeeding crop. In all our experiments the cover crop was plowed early—by April 20—and while the plant was in a succulent stage. It is not known whether the practice of cover crop fertilization would have given as good results if the cover crop was allowed to become woody before plowing. This has to be investigated thoroughly before it can be recommended as a general practice.

Phosphorus fixation. We have no serious problem of phosphorus fixation on the soils used in these investigations. Plowing under of fertilizer has as a rule given about as good yield as any other method of fertilization. Where phosphorus fixation is a problem, the spreading of fertilizers on cover crop may cause some tie-up of phosphorus. How-

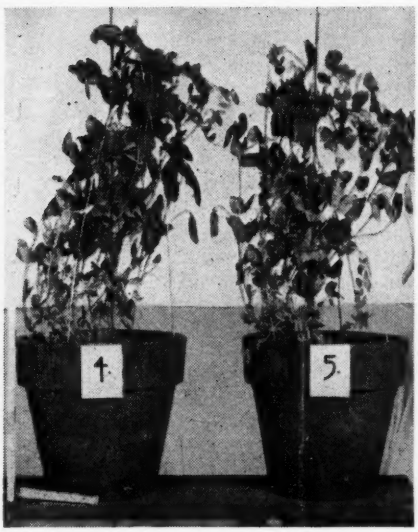


Fig. 7. Peas grown on soil and cover crop removed from experimental plots. Pot 4 received mixed fertilizer on the cover crop in the field; pot 5 received fertilizer before planting peas.

ever, phosphorus absorbed by the plant should be highly mobile and available for succeeding crops. Phosphorus broadcast on cover crop and plowed under should, therefore, suffer less fixation than phosphorus applied to bare land or to cover crops just prior to plowing.

Leaching of nutrients. Work is now being done to determine the extent of nutrients lost when applied to cover crop in fall or late winter. Many more plant analyses will have to be completed before this is properly evaluated. From the standpoint of yields only, it seems that there is no greater loss of nutrients from this method than conventional application of fertilizer. It must be remembered that fertilizer was always applied to a cover crop which was already well established. This is important because loss from leaching and erosion will be markedly influenced by the type of cover present. Also, in our large field experiments, ammoniated superphosphate was the source of nitrogen. Previous experiments have shown this form of nitrogen to be quite resistant to leaching. Chances of success with this method of fertilization are enhanced with the use of a resistant form of nitrogen in the mixed fertilizer and if fertilizer is applied to cover crops already established.

Long-time effects. The small changes in organic matter brought about by cover crop fertilization have not been enough to appreciably affect organic matter in soil or yields of following crops. It is suspected that continued use of such a practice would make an appreciable difference.

Practical application. Bulk fertilizer spreading is possible without cover crop fertilization. It definitely becomes a practicality when fertilizer can be spread over large areas during long periods. From the viewpoint of both fertilizer dealer and farmer, the fertilization of cover crops need only be as good as regular methods of fertilization. If is is as good, both stand to gain by bringing a lower cost fertilizer to the farmer and eliminating considerable drudgery from an important farm operation.

Conclusions

Based on three years of experimental work, findings of the G. L. F.-Seabrook Farms Raw Products Research Division have shown that fertilization of non-leguminous cover crops:

1. Will produce a larger amount of organic matter by the cover crop. The rye cover crop is greater stimulated than rye grass.
2. Can be used as a means of supplying fertilizer to peas and perhaps other vegetable crops.

The fertilization of the cash crop by applying fertilizer to the cover can be a major factor in making the bulk fertilizer spreading program practical. Bulk fertilizer spreading means savings in costs of fertilizer and eliminating the hard work of an important job on the farm.

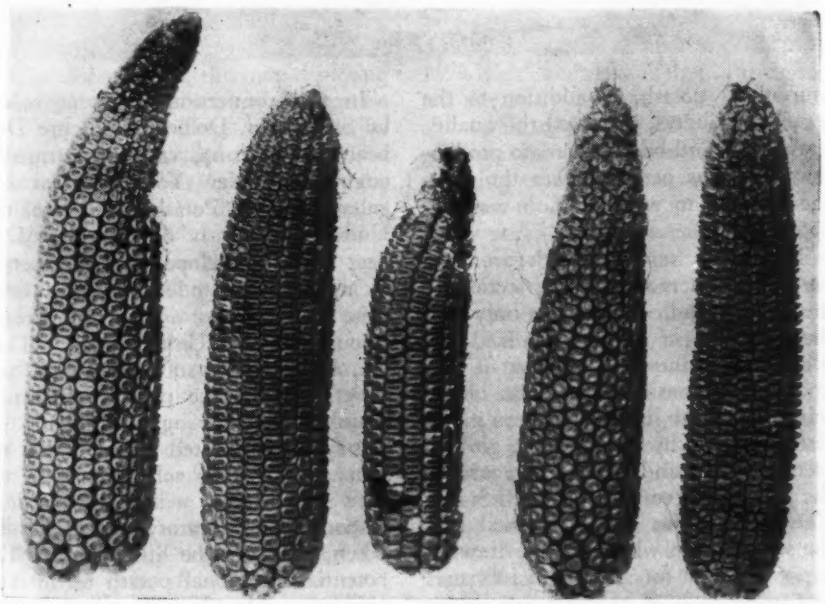
Potash Meets Its Responsibilities

(*From page* 14)

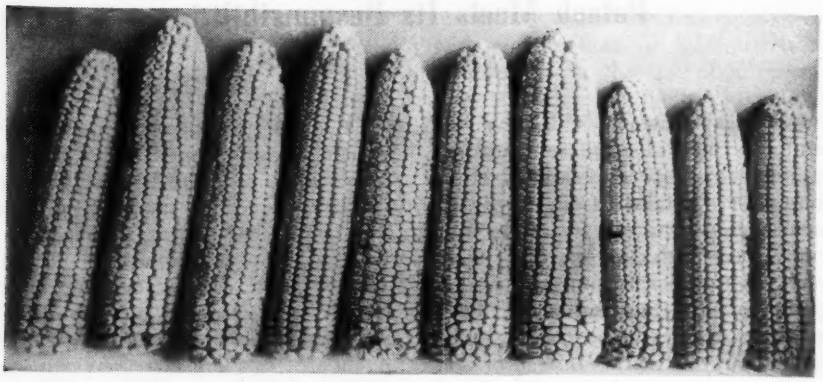
previous experiments yields have been limited because of insufficient nitrogen. In many of these experiments no increases were obtained from other treatments because nitrogen was the limiting factor. With close spacing, shallow cultivation, sufficient nitrogen, and adequate mineral fertilization, yields of corn are being doubled and trebled throughout the South. Instead of small applications of straight nitrogen, Southern agronomists are now recommending pre-planting applications of 400 to 600 pounds per acre of such mixtures as 6-8-6, 6-8-8, 4-8-8, or 3-9-9 with heavy applications of nitrogen as a side-dressing.

As vegetable growers satisfy the lime requirements of their soils and find it impossible to get animal manure, it is necessary to use more potash. Commenting on vegetable fertilization, Tiedjens states: "The ratio of nutrients in any case must be determined locally. There is one thing that seems well established. As the lime requirement of the soil becomes satisfied, the potash level must be higher. The phosphate level need not be emphasized. In other words, where a 5-10-5 is being used at the present time, the grower may find that an 8-8-16 or a 10-10-20 in equivalent amounts will increase yields materially."

On many truck crops such as potatoes and tomatoes, potash in addition to that in the regular fertilizer is recommended. The Delaware Extension Service in its annual report states: "1940 saw the continuance of costs of production records and fertilization tests on tomatoes in Kent County. Twenty-five tomato growers maintained cost account records. Seventeen of these same tomato growers demonstrated that the use of 200 pounds of



Corn plants having insufficient potash produced poorly filled ears of low quality.



Above: Corn plants having an abundance of nitrogen, phosphate, and potash produce well-filled ears of high quality.

Below: Additional potash prevents lodging of corn. Corn on right fertilized with 8 pounds K_2O per acre; on left fertilized with 48 pounds K_2O per acre.

muriate of potash, in addition to the regular fertilizers, increased the quality of the crop and boosted tomato production two tons per acre over the average of plots to which potash was not applied."

The above reports which are supported by others from every section of the country indicate that not only will the high rate of potash in mixed fertilizers be maintained, but that it will undoubtedly continue to increase. Realizing this, much interest has been manifested recently by the industry, government officials, and others in regard to the potash reserves of the United States. The opinion has been expressed that the supply from which we are drawing is not sufficient for more than 100 years at current rates of consumption or for 50 years at desired rates.

In this connection, a recent report by Samuel H. Dolbear, of Behre Dolbear & Company, consulting mining engineers of New York and Los Angeles, entitled, "Potash Reserves of the United States," is of interest. Dolbear says: "Developed potash reserves in mines now under operation comprise a small part of the total potash resources of the United States. They are, however, of substantial size and they constitute the present sources of potash supply for agriculture and industry in the United States. That the tonnage of highly soluble salts in the New Mexico area will be substantially extended if exploratory work is undertaken, there can be little doubt. The potential additional potash ore in that area is possibly 400 million tons or four times that presently developed." It is

also pointed out that the beds of sylvite-carnallite ore in eastern Utah appear to be 10 to 20 times as thick as the sylvite beds in New Mexico; that polyhalite is widely distributed through New Mexico and Texas, and the established reserves in Carlsbad area alone are extensive enough to supply the demand in the United States for over 200 years. In addition other soluble and insoluble forms of potash are reported. Dolbear thus concludes: "Potential and developed potash reserves in the United States are of such magnitude that, with a reasonable rate of exploration and development, there is no foreseeable shortage of supplies for agriculture and industry for hundreds of years."

More Food—Fewer Farmers

(*From page* 5)

high-yielding, disease-resistant cereals. If you think that such better strains don't take a whale of a lot of extra plant food to make a crop, then you are sadly behind the times. The scientists have figured that it takes about two pounds of mineral plant food to produce each extra bushel of corn. In Iowa alone the 15-bushel increase in average corn yield per acre has meant using up 30 pounds or more extra plant food. That figures to 160,000 tons of extra plant food for Iowa soil alone, as a result of the smart work done by Henry Wallace and his fellow corn breeders.

That doesn't solve the man-depleting problem though. Machines will handle the fertilizer-restoring task easily. What to do with the displaced hired men and crop of boys is our next pesky problem. They can't all be coal barons or labor bosses. We have to find some respectable work for them.

Next, or second, on the agenda is the fact that our farms are getting fewer and larger. Along about 1920 we boasted six and a half million separate farms. Now this has shrunk by more than half a million. In 1920 the average farm occupied 150 acres. From the latest report I got from the census, it had reached fully 200 acres.

Back in the days of the Centennial Exposition of 1876 there were not 4,000 farms that covered up to 1,000 acres each. Right now there are 110,000 farms in that category. And there's another angle. In 1930 we had close to a billion acres in farms. The 1945 census shows a total of 1,500,000,000 acres. We now have four times as much farm land as we had 100 years ago. It has been growing at a fast clip, although the pity is that a good share of the present acreage is not worth much more than when the Kiowas and the ground-hogs and rattlesnakes owned it. I mean it isn't if you put it to the acid test of a few unfavorable price or weather seasons.

Now let's see what the working force amounts to in terms of production power. The only trouble in comparing 1870 with later years is that in the good old days they counted in kids 10 years old, while nowadays with all the gadgets we have to do with, we begin counting employed persons on farms at 14 years of age.

About 75 years ago some 6,850,000 persons worked the land. Their combined food output was worth about $360 apiece. In 1946 they tell me that 8,200,000 workers are engaged in farming, 20 per cent more, but they make a crop valuation at recent prices which gives them an average productive worth of 700 per cent better than the old-timers. That means the farm laborer today makes a crop worth $2,500 at going rates of value. I am not saying a word here about how much more it costs him to keep going, because therein also lies a vexing topic for menders to tinker with.

GRANTED that mere price differences might distort any such contrasting picture, it still remains true that the average farm of our era outyields the one of our grandsires by nearly three times. The same machine age that has done so much to make this possible has also operated to expand the markets of the farms and bring their products to consumers at greater distances.

While all this was taking place something else was happening to the traditional family farm unit. Compared to the years at the beginning of American independence, we now have 350 times as many of our people residing in cities, but only 16 times as many folks staying on farms. Only one person in seven works at agriculture.

Despite all our courageous efforts and our earnest experiments and resolutions to safeguard and make attractive the life on the land, we witness a dwindling farm force as the years go by. To be sure when severe depressions come our way, as come they ever will, the tide turns a trifle for a season or two—and we find refugees crowding back on farms to make themselves as useful as possible even in the face of a poor market outlet and a vastly accelerated output.

Temporarily also when wars surge up on our shores and we man the defenses and spur production, we see a drift by the ambitious farm crew into crafts that pay bigger money and shorter hours. As far as present returns show, not all of those who left the land during the latest carnage have come back again. Land values are too high and equipment too costly, and there is not room enough even to take care of the youngsters who left five years ago—with all the multiple power we now possess to plow and reap.

America's breadbasket of the Midwest lost about two and a third million persons from farms in the 12 years between 1930 and 1942. Here we have the richest food larder in the world, perhaps, with what should continue to be a profitable place to make a decent living and rear upstanding families.

Without doubt the machine, more than any other single factor, is accountable. The same thing has happened in Virginia, as one of my friends on a farm journal has noted. He remarks that improved machinery has not seemed to reduce the average day's work in that State very much, because there are fewer hands left in the wake of the new power. The sons and daughters of these good agricultural regions are moving out as fast as their jobs become scarce, with the purchase of better equipment.

THE birth rate drops gradually and the proportion of older farmers increases along with this drift away on the part of the vivid and virile juniors. If you want to do some thinking, just figure for your own state the percentage of operators of farms who were 55 years and over in 1945.

Does this mean a permanent falling off in the quality of our available management and man power in years ahead for agriculture? Is it possible that enough of the "prodigals" who left the farms will retain enough actual or secondary interest in the enterprise to filter back as the elderly operators relinquish their titles and become too few and feeble even to ride a tractor? Are we going to see a slow but sure increase in our birth rate by these husky young men and women who pose for pictures as health champions at 4-H fairs? So far the answer is a negative one. Modern couples on or off the farm simply do not reproduce themselves in the hearty old-fashioned way. You can't bank on the rapid bulge in the post-war baby crop to be maintained. That's one thing at least we can't speed up with our modern mechanization technique.

IN fact, I don't know what it takes. Some say security and content. Maybe parity prices or soil conservation or stabilization is the answer, but I doubt it. If you think production

control with hogs and corn has almost ruined farm integrity, how about birth control—which is just a different form of production control anyhow.

Of course, the fecundity rate is better in the open country still than it is in the Hogan's alleys or on the Broadways, but it simply isn't too good anywhere—compared to the good old days. And if you can tell me how we are going to keep on mechanizing for more food on one hand and skimping our infant output with the other and still come out minus the surplus bogey, I will be well paid for my time.

The real answer could be hunted for among the neglected zones of this and other lands where the baby crop gets less thought than the pig crop maybe. Malnutrition is a big foe of the birth-and-child-rearing industry. Some of the surplus can be thus diverted if we can find a way to make it pay us. Charity gets so monotonous that it seldom gets a royal welcome attached to any food-distributing scheme.

We must not quit on a sour note. Fully 98 per cent of our six million farms are run as family units yet. They are a way of life even in the face of overwhelming pressure to make them commercial. There are some remarkable counties in the country, notably in the East and Northeast, where production increases steadily, soils are safeguarded well, and the farm population does not diminish.

They say that if the whole area of some rich Midwest state were farmed according to the system long in use in some of the most intensive rural counties aforesaid there would be provided enough profitable employment for several hundred thousand more families.

There is a way also to encourage more canning, packing, and processing industries in the heart of the Corn Belt, and to get more general manufacturing there, so that the huddling of so vast a portion of our folks in cities will not add to the terror of any struggle between powerful business and labor groups.

I shun from naming any atom bomb business as reason for development of larger rural centers, but I know that we are entering an era of shorter work weeks and some city inhabitants will begin to look for places in the country to combine local factory or shop jobs with part-time farming.

At any rate, I for one will not get so ruthless in my philosophy as to allow that we must have cheap food, no matter if efficiency in its production means having many less folks living on farms. I think there are lots of people yet who keep up old aspirations and visions regarding the normal values and virtues of farming. They hate to be completely out of date or queer and behind-hand in their ways and works, but they cling somehow to old ideals that held up the farm as something besides just a place of barter and cash on the barrel head.

I DON'T know as I care to live and ride the roads as I used to if we are obliged to shift gears plumb smack dab into a maze of dollar signs and high pressure commercialism plastered on every rural gate post. I wouldn't find my kind of folks living there I'm afraid. Let's hold back on it as long as we can even at the risk of being old fogeys.

More Power!

The farmer was trying to get his balky horse started when the local doctor came along. "Can you get this derned animal to move?" asked the farmer. Doc nodded his head, opened his bag, took out some powder and placed it in the horse's mouth. The horse rolled his eyes, switched his tail, and suddenly went into action, galloping down the road. Watching the horse rapidly disappearing, the farmer asked anxiously, "How much did the powder cost, Doc?"

"About a quarter," was the answer.

"Then you better give me 'bout a half dollar's worth—quick—'cause I've got to ketch 'im!"

The train was pulling out of the station when a young man threw his bag onto the observation platform, and swung himself up over the handrail. He stood panting as the train gathered speed. An elderly party said scornfully: "You young fellows don't keep yourselves in condition. When I was your age I could carry a cup of coffee in one hand, run half a mile and catch the 8:15 and still be fresh as a daisy."

"You don't understand pop," said the young man, "I missed this train at the last station."

"How dare you swear before my wife," demanded the indignant husband.

"I am very sorry," replied the intoxicated man, "I was unaware that your wife wanted to swear first."

If louses are lice
And mouses are mice
Would you say that a guy
With two spouses had spice?

Today I met a friend of my youth who used to be an ardent socialist, filled with visions of reforming the world. He says he never got over it until he married and found how difficult it is to change just one woman.

She: "There's one thing I want to tell you before you go any further."

He: "What's that?"

She: "Don't go any further."

Wife: "What tense is 'I am beautiful'?"

Husband: "Past."

"Yo sho does look worried."

"Boy, I'se booked up solid on worrying. I'se got so many worries on mah mind that if sumpin happens to me today, Ah won't get time to worry about it foh two weeks."

The doctor had examined the lanky recruit and was filling in the medical form. "That's everything except the sputum test," he said. "Just expectorate in one of those vials on that shelf at the far end of the room."

"What d'you mean, doc?"

"Spit in one of those bottles on the shelf at the far end of the room."

"What! All the way from here?"

Sue was congratulating Mary on her driving ability: "Why, you're handling the car like a veteran."

"How do you know," countered Mary. "You've never seen me handle a veteran."

Ad in English paper: Owner of tractor wishes to correspond with widow who owns a modern thresher; object matrimony; send photograph of machine.

DRIVER'S License Examiner: "Do you know what it means if a driver puts out a hand?"

Applicant: "Well, if it's a woman, it means she is going to turn right or left, shake the ashes off her cigaret, or reverse or stop, or she's pointing to a hat store, or admiring her ring, or—"

Examiner: "Yeah, and if it's a man?"

Applicant: "Why he's usually waving at a woman."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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for agriculture

20 Mule Team. Reg. U. S. Pat. Off.

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The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

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Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)

Reprints

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R-3-45 Higher Corn Yields for North Carolina
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A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

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